Electrical World

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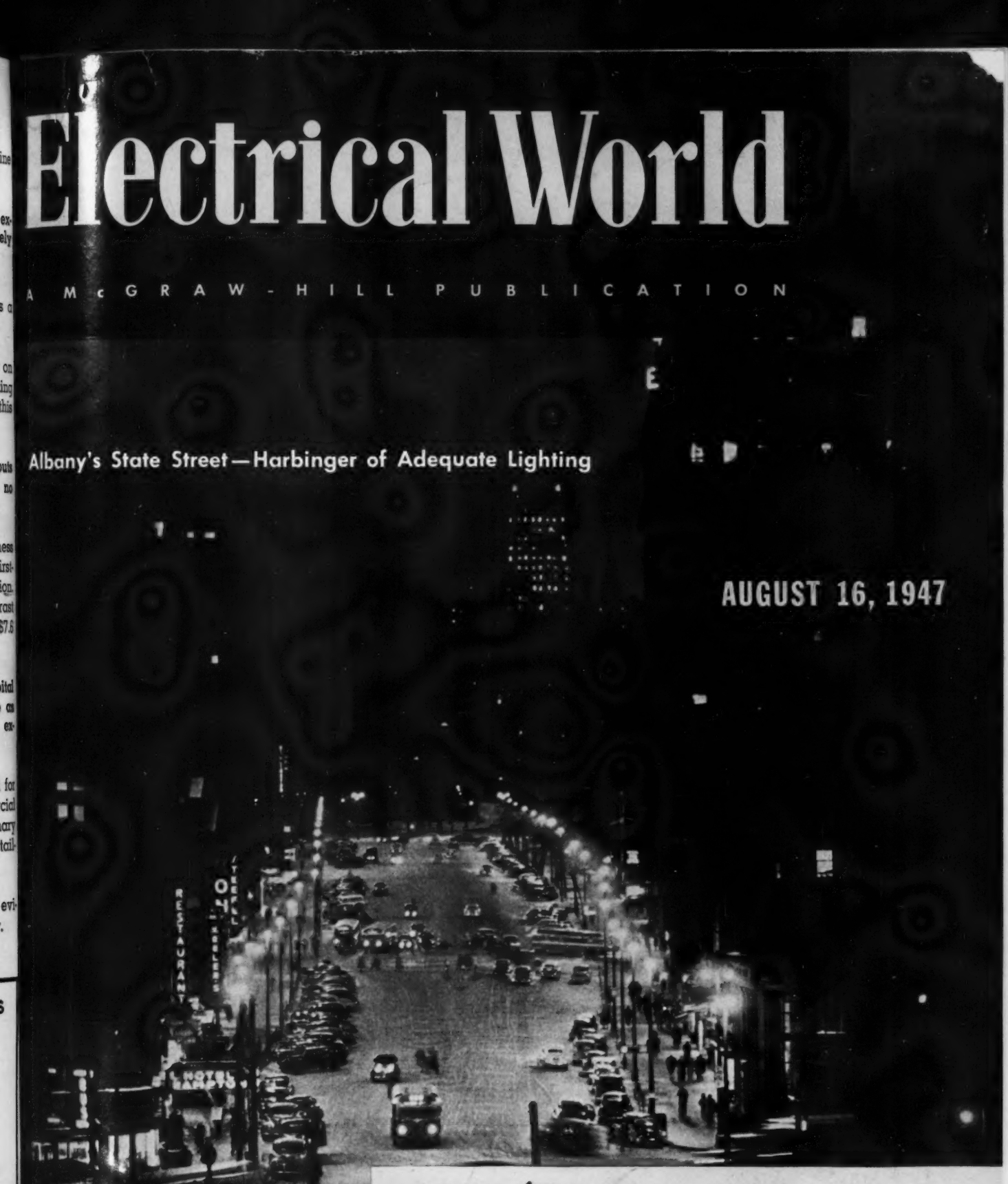
Albany's State Street—Harbinger of Adequate Lighting



AUGUST 16, 1947

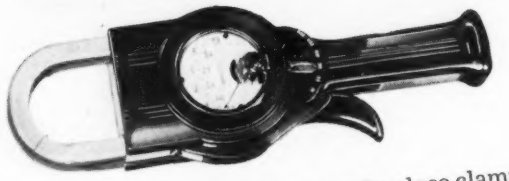
Features

Mobile Detector Locates Faults on Overhead Lines

Control Centers for Substation Supervision

Dam Spalling Repaired by Concrete Gun

TIPS on off-setting rising production costs!



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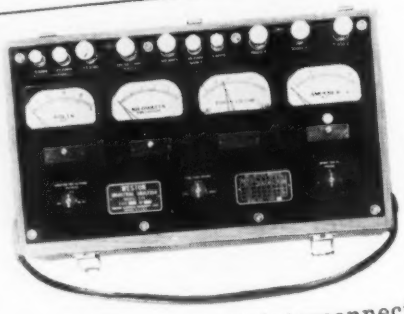

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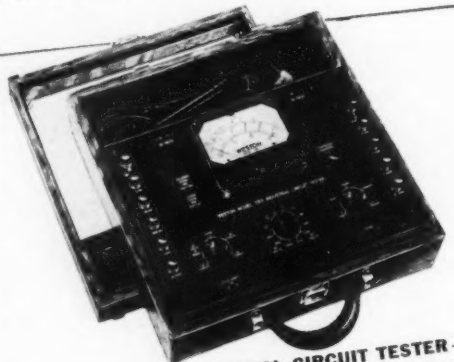

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Electrical World

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ELECTRICAL WORLD. Published weekly by McGraw-Hill Publishing Company, Inc. Publication Office, 99-129 North Broadway, Albany 1, N. Y. RETURN POSTAGE GUARANTEED. Editorial and Executive Offices, 330 West 42nd St., New York 18, N. Y. Allow at least ten days for change of address. All communications about subscriptions should be addressed to J. E. Blackburn, Jr., Director of Circulation. James H. McGraw, Founder and Honorary Chairman; James H. McGraw, Jr., President; Curtis W. McGraw, Senior Vice-President and Treasurer; Joseph A. Gerardi, Secretary; Nelson Bond, Director of Advertising; Eugene Duffield, Editorial Assistant to the President. J. E. Blackburn, Jr., Director of Circulation. Subscription rates: Single copy 35 cents. In the United States, $6 a year, $9 for two years, $12 for three years. Canada, $7 for one year, $11 for two years, $14 for three years. (Canadian money at par.) Pan-American countries, $15 for one year, $25 for two years, $30 for three years. All other countries $20 for one year, $30 for two years, $40 for three years. Please indicate position and company connection on all subscription orders. Entered as second-class matter, November 16, 1936, at the Post Office at Albany, N. Y., under the Act of March 3, 1879. Printed in U.S.A. Copyright 1947, by McGraw-Hill Publishing Company, Inc. All Rights Reserved. Cable address MCGRAWHILL, New York. Branch Offices: 520 North Michigan Avenue, Chicago 11, Ill.; 68 Post Street, San Francisco 4; Aldwych House, Aldwych, London, W. C. 2; Atlanta, Ga.; Boston, Cleveland, Detroit, Los Angeles, Philadelphia, Pittsburgh, St. Louis, Washington. Member A.B.P. Member A.B.C.

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Electrical World

AUGUST 16, 1947

Less Than Was Needed

On June 21, ELECTRICAL WORLD urged that Congress appropriate enough money to meet the power needs of the Pacific Northwest and the Lower Colorado River Basin. The government has monopolized the only economic energy sources in these areas, thus assuming the proprietary responsibility for power supply. So, ELECTRICAL WORLD insisted, the government must keep area power supply ahead of demand. This obligation is more sacred than economy.

Since then, Congress has passed the Interior Appropriations bill. Let's see how the obligation was met.

Congress' action was both good and bad. From a cold, professional viewpoint, the Interior bill was a poor job. It does not *assure* the power users of *both* regions that the energy they need will be there when they need it. Bonneville has the money it needs for another year. This is good. But the Reclamation Bureau got only half its needs for the next year's work in Arizona.

As it happens, this does not mean that Arizona power users can not be served. If the predictable occurs, Reclamation will spend its Arizona money promptly, then seek a deficiency appropriation early next year. Prospects for the extra funds are not at all bad. One generally gets something from a deficiency request if he shows a real need. Also, consider the Republican legislative strategy—which is to economize in 1947 and spend in 1948, a presidential year. On this basis, there still is hope.

The way it handled the problem facing these two areas reveals once more Congress' lack of any real knowledge of public service industry. We do not expect Congress to know the power business in detail. But, currently, the government is in that business; so we do expect it to learn and apply the fundamentals.

Congress is the finance committee of what might be called the "United States Power Co" It may no more disregard the absolute necessity of keeping supply ahead of demand than may any private company. Yet repeatedly, it legislates in such a blithe way as to indicate that it either does not know this rule or does not respect it.

So anxious is Congress to economize that it begrudges funds to projects needed to meet the government's obligations to its citizens. Then why doesn't it look more carefully at spending for duplicating facilities and for unenonomic competitive schemes? These continue to be built —in California's Central Valley, in the near Southwest, in some parts of the Northwest and elsewhere.

Power supply is a serious business. Political whim or strategy must not be allowed to govern it. Thus far in Arizona, Congress has done less than it should. Does this mean that Congress lacks either the intention or the ability to do a serious power job? If so, it is another reason why Congress should take the government out of its proprietary position.

★ ★ NEWS OF THE

TVA Act May Be Amended to Recover Power Investment

Senate Committees Are Expected to Study Amendments Early Next Year—Government Accounting Office Suggests Changes —TVA Wants Proposals Studied Apart from Appropriations

THE Tennessee Valley Authority Act may be amended next year. If it happens, it will be because Congress continues to be unhappy about plans to recover U. S. investment in TVA's power and other facilities.

Two Senate committees began to study proposed amendments before Congress adjourned last month. Both are expected to continue them early next year.

At stake is a plan which calls for repayment over 40 years. It was adopted this year by Congress but is under wide attack. The economy bloc says it is no pay out plan at all since it does not make TVA pay interest or certain other charges. TVA people say the formula is legislation by an appropriations committee. They want the matter considered, if at all, apart from appropriations.

There is strong Senate support for reform of TVA accounting and financing. In the main, it follows the recommendations of the first General Accounting Office report of last spring. The staff of one Senate committee has discussed them several times this summer with GAO and TVA. Last week, GAO gave its version of the language needed to make the reforms it wants.

These changes, which went to the Senate's Public Works Committee, came after the staff of another Senate group—Executive Expenditures—also reported on the original GAO changes, of last spring. The Executive Expenditures staff endorsed some of the original GAO suggestions. In particular it okayed the idea of TVA's paying interest on power investment. But it was strongly against anything which would hurt TVA.

The GAO report, suggesting specific language for the changes it would make, is based on the original GAO report of last spring. It calls for repeal of two parts of the present TVA act—Sections 9 (b) and 26—and for amendment of another—Section 12. In their place, the GAO plan would:

1. Set up accounts for electric operations, for fertilizer, and for other "commercial products." Each would have to be self-supporting and self-liquidating.

2. Add two charges to the costs of these commercial operations—interest during construtcion and employee injury and death compensation.

3. Set up separate capital accounts to ascertain investment in commercial and non-commercial facilities.

4. Permit the Treasury to take over TVA bonds now held by RFC.

5. Start a 40-year power repayment plan in fiscal 1949. Each year, TVA would have to make equal payments on capital, plus 2.5 percent interest.

6. Make TVA pay for future power additions in 40 years. Interest would be at the Treasury's going rate.

7. Make TVA pay to the Treasury each year its "net income" from fertilizer and other commercial investment. Any more funds for "research and development" could only come from appropriations.

8. Let TVA pay off power investment ahead of or behind schedule, depending on its income.

9. Have GAO verify TVA's annual repayments.

10. Let TVA use any revenues not obligated for amortization. Also, it could borrow up to $10,000,000 from the Treasury for emergency additions to commercial facilities. None of these

UNUSUAL HONOR—To show the high esteem in which members of the Street Railway Union, No. 732, held the late Preston S. Arkwright, president of Georgia Power Co, the union collected funds for this bronze bust of the utility president. The bust will be placed in the new transportation building of the company. In the front row, left to right, are Miss Anne Arkwright and Miss Dorothy Giddings, granddaughters of Mr Arkwright, who unveiled the memorial. In the rear row are Charles B. Gambling, president of the Georgia Federation of Labor; Jesse Walton, president of Local 732; and Preston S. Arkwright, Jr., president of Georgia Power

funds could be used for a major addition.

11. Have Congress make separate appropriations yearly for TVA's non-reimbursable costs and for its revenue-producing costs.

12. Make TVA repay the Federal Security Agency for TVA employee claims paid by FSA.

13. Set up separate accounts to show "net income" from power and other commercial operations.

•

Washington Water Power, Pacific P & L May Merge

Plans which would make the Pacific Power & Light Co, operating in Oregon and Washington, a subsidiary of the Washington Water Power Co have been announced in a joint statement by Kinsey M. Robinson, Seattle, president of WWP, and Paul B. McKee, Portland, president of Pacific. The proposal provides for transfer of Pacific's stock from New York to the Pacific Northwest.

The announcement was made currently with filing of applications with the Securities and Exchange commission for the first step in the program—transfer of Pacific's common stock by the American Power & Light Co to WWP. American then would sell its common holdings in the Washington company, making that company and Pacific an independent integrated system. This could conform to a dissolution program ordered by SEC.

Under the plan directors of Pacific would be elected to the Washington company board.

•

Arklahoma Files to Buy All of Ark-La Co-op System

Arklahoma Corp, Little Rock, has filed a substitute application with the Arkansas Public Service Commission for authority to buy transmission lines and substations from Ark-La Electric Cooperative. The price would be $3,800,000. The facilities would be leased to Arkansas Power & Light Co, Oklahoma Gas & Electric Co, and Southwestern Gas & Electric Co.

Under the original application, Arklahoma was going to buy the lines, and Southwestern substations.

First Atomic Energy Plant in Britain to Be Built Soon

Britain's first atomic energy plant will be set up soon at Sellafield, West Cumberland, on England's west coast.

The plant is intended primarily for production of fissionable material in a chain-reacting pile. It may be used also for power generation of electricity. Its capacity is not disclosed for security reasons, but it is not likely to be so large as some premature reports have suggested. These reports have mentioned an electric generating capacity of as much as 75,000 kw. In any event, the Central Electricity Board, which built a small generating plant at Drigg, a few miles away, is not now counting on any generating capacity from the atomic energy plant. The atom project forms no part of the CEB's huge 5-year expansion scheme.

The Sellafield plant will be erected on the site of a Royal Ordnance Factory. Construction is to begin very shortly. The Ministry of Supply says it "will give employment to a considerable number of men for some time to come."

The new plant will be the second link in Great Britain's atomic energy projects. The first is the production of pure uranium from pitchblende concentrates. This is going forward smoothly at the Ministry of Supply's factory at Springfields, near Preston. One consideration in locating the plant for the production of fissionable material from the uranium was that it be reasonably near Springfields. Another was that it be an already prepared site, to save time.

The Minister of Supply meanwhile has told Commons that Britain's first experimental pile will be in operation by the end of this year. It is at Harwell, Berkshire, in a research establishment set up last year. The Government hopes to establish at Harwell a university of nuclear fission second to none in the world.

Contractors to Study Increased Productivity

Present costs of electrical construction will be reviewed at the annual meeting of the National Electrical Contractors Association in San Francisco September 8, 9 and 10, NECA officials announced in Washington this week.

The forum-type meeting will be devoted largely to a critical analysis of all elements of productivity related to electrical construction, repair and maintenance, with the objective of determining what steps may be taken to lower present costs, according to Robert W. McChesney, president of the association.

Representatives of the electrical manufacturing industry, electrical wholesalers, utilities, labor and contractors will report on the effects on their fields of present levels of costs and productivity.

"The important problem facing our industry," McChesney asserted, "is to increase productivity. That is a job that must be shared jointly and realistically by both labor and management.

"Wages in our industry are high and that calls for high output per man-hour to justify them. Management must be extremely alert and ingenious in method and equipment to keep the productivity level high so that all three partners in our economy, our customers, our workers, and our management, get a fair share."

He expressed a conviction that the meeting would result in "definite plans" for increasing productivity in the industry.

•

City to Take Street Lights

Montreal, which now owns but 600 street lights, will gradually take over 10,400 lights owned, operated, and maintained by the Quebec Hydro-Electric Commission and will add 4,000 others.

CONTRACTING FOR 'TELEQUIZZICALLS'—C. E. Michel, seated in center, vice-president of Union Electric Co of Missouri, clarifies some details with Walter G. Heren, advertising manager, standing at the right, before signing a contract for a weekly television quiz program. The others are, left to right, Guy Yedell, sales manager for KSD-TV; William G. Moore, account executive Gardner Advertising Co; A. B. Rodner, president, Television Advertising Productions, Inc, Chicago; and Al Chance, manager of the St. Louis branch of Televisi on Advertising Productions

Union Electric Sponsors First Television Program

Union Electric Co of Missouri has become the St. Louis pioneer in the production of a dramatic program via television by signing a contract with station KSD-TV for "Telequizzicalls."

The weekly half-hour show involves audience participation via telephone calls. Electrical appliances are given as prizes for the solution of old-fashioned charades.

The scene is set for acting out a charade and just before the dramatization starts, the master of ceremonies dials a telephone number. He asks the person called to watch the charade carefully and to be ready with the answer at the end of the act. A girl in the studio, meanwhile, points out the location of the number called on a large map of the St. Louis metropolitan area.

Until television receiving sets are more numerous, telephone numbers will be selected from the list of 700 persons and retailers now having sets in operation within the KSD-TV listening radius.

•

Form Consulting Firm

Wearn, Vreeland, Carlson & Sweatt, Inc, has been organized as utility and industrial power consultants and constructors with offices at 72 Wall St, New York 5, N. Y. The firm specializes in surveys and reports, design and construction of power generation, transmission and distribution facilities in new and existing plants. Officers are G. E. Wearn, president; M. A. Vreeland, vice-president; E. L. Carlson, treasurer; T. O. Sweatt, secretary.

•

Vermilion, Alberta, Plant Sold to Canadian Utilities

Ratepayers at Vermilion, Alberta, have voted to sell the municipal power plant to Canadian Utilities, Ltd., Calgary. The company will pay $120,000 for the plant and assume town obligations for equipment already ordered. Under the terms of the franchise, a $250,000 steam power plant will be erected to serve Vermilion and other Alberta communities. There is also to be a rate reduction of about 30 percent.

•

3 More TVA Units

Construction crews are at work at Fort Loudoun dam of the Tennessee Valley Authority near Lenoir City, where two 32,000 kw units will be installed. The additional units will double the capacity of the plant. At Douglas dam, Sevierville, where two 30,000-kw units are in operation, a 26,000-kw unit will be installed.

China Halts Plans for Dam; Economic Situation Cited

China has halted planning on its gigantic, multiple-purpose Yangtze Gorge Dam. The Chinese government cabled the Bureau of Reclamation, whose engineers were drawing up plans for the project, to arrive at an "appropriate" stopping place in this work as quickly as possible.

A subsequent letter from the Chinese government, as well as conversations with Chinese officials in this country, assured the Bureau that the stoppage would be only temporary. The suspension was necessary, it was explained, because of the "bad economic situation" now prevailing in China.

The Bureau has been drafting plans for the Yangtze Dam under a $500,000 contract. The Chinese government advanced half this amount and agreed to put up the remainder when it was needed. Only about $100,000 of the original payment has been expended to date, Bureau engineers reported.

Preliminary plans for the project, which is to be erected in the Yangtze River near Ichang, call for a 750-ft. high dam to provide power, flood control protection and irrigation water for 10,000,000 acres of land. Eventual installation of 96 hydroelectric generating units developing a total capacity of 10,368,000 kw also is planned. Total cost of the project is estimated at approximately $1,000,000,000.

Australia Will Double Capacity

McGraw-Hill World News

The rapid electrification of Australia following the war has led Commonwealth's utilities, mostly public owned, to plan projects which will practically double the present installed capacity of 1,964,542 kw, much of which is superannuated, sub-standard equipment. Projects now in progress will add 821,500 kw of capacity, and an additional 810,000 kw of capacity is being planned. Only 13 percent of present capacity is hydro, and 4 percent is internal combustion engine. In current programs emphasis is on hydro power and on utilization of low-calorific brown coals.

Australian Power Capacity

	Area	Population	Present Capacity	Projects in Hand	Planned
New South Wales	309,433	2,893,656	804,500 kw	355,000 kw	300,000 kw
Victoria	87,884	2,010,927	552,200	105,500	330,000
Queensland	670,500	1,075,787	184,200	60,000	123,000
South Australia	380,070	627,490	153,800	180,000	.....
Western Australia	975,920	489,691	81,000	94,800	.....
Tasmania	26,215	247,379	184,800	27,000	57,000
Northern Territory	523,620	5,220	4,842	.....	.....
Total	2,973,642	7,350,150	1,964,542 kw	821,500 kw	810,000 kw

Coal Supplies Adequate

New South Wales—Extensions to thermal stations in this state will add 355,000 kw, with another 300,000 kw under consideration. The new plant at Balmain, which operates at a steam pressure of 1,200 psi, has been designed to accommodate turbo-alternators with an aggregate capacity of 300,000 kw. This state produces more than 80 percent of Australia's bituminous coal.

Victoria—This state is developing its power with its two resources, brown coal and water, in mind. A series of hydro stations at Kiewa in northwest Victoria will boost the useful capacity of the Kiewa storage from 117,000 to 289,600 kw. Present and predictable power demand will probably not be overtaken before 1951 when substantial additions to the Yallourn briquette-burning power plant and metropolitan peak-load steam stations will be in operation, in addition to several hydro units at Kiewa.

Briquettes from Brown Coal

Two new briquette factories with a combined capacity of 1,300,000 tons a year are planned by the State Electricity Commission to make the state independent of New South Wales black coal. Briquette boosts the calorific value of raw brown coal from 3,750 Btu/lb to 9,500 Btu/lb. Experts of the Commission are in Germany studying the latest practices in the utilization of brown coal.

Queensland — With hydroelectric capacity only 4,200 kw of its 184,200-kw total, Queensland is turning to water as a source of its future power. Initial development of the Tully Falls provides for a 17,000-kw plant, ultimately to be 45,000 kw. Other hydro projects will add another 60,000 kw.

Brisbane City Electric Light Co has asked bids for two 30.000-kw generating units, and a 15,000-kw plant will be installed at Howard, near Maryborough. At Rockhampton, a 22,500-kw plant is going up to supply a wider area to the mining district at Mount Morgan.

Under the Regional Authorities Act of 1945, five power regions have been constituted along the Queensland coast. A number of 66-kv transmission lines is under construction in each of these regions.

South Australia — The State Electricity Trust is building a second power station with an ultimate installed capacity of 180,000 kw. One of the main problems of distribution is the sparsely settled rural areas. The 33-kv Adelaide-Booleroo transmission line, 170 miles long, has a maximum load of only 800 kva.

Like Victoria, dependent on brown coal but with no alternative water power resources, South Australia is following with great interest the latest American advance in the design of boilers using pulverized coal. Moisture in the raw brown coal is reduced to about 12 percent from 30 to 40 percent by action of saturated steam about 350-psi pressure.

Western Australia — Steam power units under construction will bring this state's obsolete 40-cycle system in line with the 50-cycle current used elsewhere in Australia. A 50,000-kw plant is being built at South Fremantle to go into operation in 1950.

The State Electricity Commission has invited bids for expansion of the 5,000-kw plant at the Collie coal field to 12,500 kw, and the small wood-burning plant in the Kalgoorlie gold field will be replaced by a 31.500-kw coal-burning plant.

Tasmania—If submarine cable transmission for 200 miles were economical, the island state of Tasmania could supply all the power needs of Victoria and South Australia in addition to its own. Hydroelectric potential is 3,500,000 hp, compared with 1,000,000 hp on the Australian mainland. Only 185,000 kw have been developed.

Progress continues with the construction of the Clark dam on the Derwent River where a 15,000-kw unit will be installed and a 12,000-kw unit may be added. A 12,000-kw unit is being installed at Waddamana, near the older Shannon station. Only three miles from Launceston, Tasmania's second largest city, a 45,000-kw plant is to be erected shortly. Further development of the Derwent River watershed and of the Huon and King Rivers will provide an additional 390.000 kw.

•

Game and Fish Officials Oppose Cowlitz R. Dam

Proposed construction by the City of Tacoma, Wash., of a hydroelectric dam on the Cowlitz River has led to objections by Milo Moore, state director of fisheries, and Don Clarke, state director of game.

More than 75 percent of the spawning grounds of the spring chinook salmon and steelhead trout would be affected, these officials say, while the development also might destroy the smelt run in the river. Since no completely successful plan of saving salmon and steelhead trout has yet been devised at dams located at or near the spawning grounds, gradual extermination of these sport and commercial species of fish may result, they say.

The Cowlitz is the only tributary in the entire Columbia River area that has not been subjected to extensive power and reclamation development and the state directors believe that the river should be set aside in perpetuity for the propagation of salmon and sea-run trout.

Utility Industry Leader in Employee Benefits

The electric light and power industry leads all others surveyed by the U. S. Bureau of Labor Statistics in the prevalence of pension and health and life insurance plans for employees. This applies nationally and individually in all seven regions of the country.

The BLS survey, conducted during 1945 and 1946, covered 15,636 establishments, 130 of them electric light and power companies.

It disclosed that 86 percent of the power utilities had insurance and pension plans. Nearest competitors were textiles, 60 percent; department stores, 57 percent; chemicals, 56 percent; and apparel, 55 percent.

The national average was 47 percent, influenced largely by metalworking plants, whose 6,647 plants surveyed comprised almost half the total.

Of the 130 power utilities surveyed. 78 percent provided life insurance, 37 provided health insurance, and 35 percent provided retirement pension. Only in health insurance, which was 47 percent prevalent in apparel, did the electric light and power industry take a back seat to another industry.

The prevalence of insurance and pension plans in the electric light and power industry regionally, with the number of plants studied, was reported as follows:

Region	Percent	Plants
New England	95	19
Middle Atlantic	94	18
Southeast	100	10
Great Lakes	80	30
Middle West	86	15
Southwest	83	12
Pacific	57	7

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Louisville, Ky., Wins Suit to Raise Taxes of Utility

Louisville, Ky., expects to collect $850,000 in back taxes from the Louisville Gas & Electric Co. and an additional $150,000 a year at present rates as the result of a recent decision of the Court of Appeals at Frankfort.

The city asked the court to order the State Tax Commission to raise the utility's property and franchise valuations for 1942 on which 1943 taxes were based.

In deciding for the city, the court declared that the franchise value had not been determined properly and that the commission had erred in including the value of concrete pilings, footings, walls, and buildings housing machinery, and a railway siding, in the "manufacturing machinery" category.

Under Kentucky law, only the state can tax manufacturing machinery; this law was passed to encourage manufacturing in the state. However, the court upheld the utility in its contention that substations, transformers, and switching equipment are manufacturing machinery.

Charles W. Milner, company attorney, scoffed at the $150,000 a year total and said that the increase is not likely to be more than $4,200 annually, which amount would be shared by the city, county, and state. He said that if there is to be a rehearing the city will have to ask for it as "company feels it has won its case."

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Canadian Stations Setting Output Record; May High

Canadian central electric stations with an output of 3,917,499,000 kwhr set a May record. At the same time primary consumption rose to 3,159,460,000 kwhr, the highest since March 1944.

In making this announcement, the Dominion Bureau of Statistics added that output for the first five months of 1947 was the highest in history. The total was 19,106,967,000 kwhr as compared with 17,270,923,000 kwhr for the corresponding period in 1946, the previous record high. Primary consumption of 15,038,179,000 kwhr, however, was still slightly below the 15,303,440,000 kwhr for the first five months of 1944.

The following statistics are in thousands of kilowatt-hours:

Period	1947	1946
Five months	19,106,967	17,270,923
Primary	15,630,021	13,229,073
Secondary	3,476,946	4,041,850
Exports to U. S.	878,302	1,069,662
May	3,918,499	3,615,777
Primary	3,280,237	2,742,089
Secondary	637,262	873,688
Exports to U. S.	188,648	237,035
April	3,727,245	3,506,258
Primary	3,087,231	2,653,745
Secondary	640,014	852,513
Exports to U. S.	186,580	236,170

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To Settle Sign Disputes

Establishment of a council for settling disputes between the International Brotherhood of Electrical Workers, AFL, and members of the National Electric Sign Association has been approved by the IBEW Executive Board. The council will be patterned after the Council on Industrial Relations which has been functioning between the union and the National Electrical Contractors Association since 1920. NESA members manufacture, assemble, and erect electric signs.

March Electric Energy Sales Rose 17.8 Percent

Sales of electric energy to ultimate customers in March, 1947, totaled 17,771,930,000 kwhr, compared with 15,090,516,000 kwhr in March, 1946, Edison Electric Institute reports.

Classification of Sales, March, 1947 and Change from 1946

Kilowatt Hour Sales March	Million Kwhr 1947	1946	% Change
Residential or domestic...	3,727	3,282	+13.6
Rural (Distinct rural rates)	320	249	+28.2
Commercial or industrial			
Small light & power....	3,026	2,622	+15.4
Large light & power....	9,285	7,592	+22.3
Street & highway lighting.	200	193	+ 3.9
Other public authorities..	491	486	+ 1.0
Railways & railroads			
Street & interurban.....	434	384	+13.0
Electrified steam railroads	239	229	+ 4.7
Interdepartmental	50	53	− 5.4
Total to ult. customers....	17,772	15,091	+17.8

Revenue from ultimate customers amounted to $313,073,500 in March, compared with $282,653,400 in March, 1946, an increase of 10.8 percent.

For the twelve months ended March 31, 1947, the average use per customer advanced to 1,358 kwhr from 1,267 kwhr for the preceeding year, an increase of 7.2 percent; the average annual bill to $43.05 from $42.57, an increase of 1.1 percent; revenue per kwhr dropped to 3.17 cents from 3.36 cents, a decrease of 5.7 percent.

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Power Resources Survey of New England Underway

Preliminary work is underway on a six-state survey of power resources. Sponsored by the New England Council, the survey will cover existing generating plant developments and programs, load trends, the benefits of interconnections, and the evaluation of present and potential steam and hydro possibilities from the economic and fact-finding standpoint.

Edgar H. Hunter, chairman of the Public Service Commission of New Hampshire and New Hampshire vice-president of the New England Council, is chairman of the survey committee. Charles T. Main, Inc, engineering consultants Boston, has been retained, and William F. Uhl, president of the Main organization, will direct the survey.

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66 Instead of 13-Kv Lines

Knoxville Electric Power & Water Board will spend over $3,500,000 to change its lines from 13 to 66 kv.

Plans for Reorganization Approved in New Vote

Portland Electric Bondholders and Stockholders Back Proposal after Judge Holds Voting Open

Plans for reorganization of the Portland Electric Power Co have been approved by the company's bondholders and stockholders, according to a new tabulation of votes filed in Federal Court at Portland by Estes Snedcar, referee in bankruptcy.

An earlier tabulation of votes was unfavorable to the plan, but Federal District Judge James Alger Fee, before whom the company's bankruptcy and reorganization proceedings were heard, ordered the voting time extended. This action was taken because of charges of undue influence against the plan on the part of Guaranty Trust Co of New York, which held a large block of the bonds.

All Classes Favor Acceptance

The new tabulation revealed that holders of $8,185,500 in bonds voted for acceptance of the plan and owners of $3,518,700 in bonds against. Prior preference stockholders voted 41,598 for and 852 against the plan, and first preferred stockholders 36,802 for and 19,467 against. Under the law owners of two-thirds of the bonds and a majority of the holders of each class of stock had to vote for the plan to make it effective.

The earlier vote by bondholders against the plan followed issuance of a letter by Guaranty Trust advising that the trust company considered the proposal unfair and inequitable to bondholders. As a result of this letter Guaranty Trust and its vice-president, Henry A. Theis, were ordered by Judge Fee to show cause why they should not be cited for contempt. It was charged that the letter was misleading and was issued without consultation with the court before which the reorganization plan was pending. Also it was charged that Guaranty had attempted to influence its nominees on the Portland General Electric board to fail to declare a dividend so that bondholders would disapprove the reorganization.

At the show cause hearing, Theis testified that it had never occurred to him that issuing of the letter without the court's permission could be construed as contempt of court, and that he had been informed by legal counsel that it was Guaranty's right and duty to issue the letter. Judge Fee then directed that Thomas O'Gorman Fitzgibbon, member of the New York law firm representing Guaranty, also be cited to show cause. Members of the PGE Board testified that the board was not influenced by Guaranty. At the conclusion of the hearing the court took the matter under advisement.

THE START OF A BIG ADDITION—Excavation work proceeds at the Avon plant of the Cleveland Electric Illuminating Co where two 90,000-kw units will be installed at a cost of approximately $25,000,000

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Water Heater Installation Manual Prepared by EEI

An "Electric Water Heater Installation Manual," which illustrates the principal wiring methods and other installation practices now used throughout the country, has just been prepared by the Wiring Committee of the Commercial Division, Edison Electric Institute.

The manual, which is the first section of a comprehensive Appliance Installation Manual to be prepared by the committee, to cover those appliances requiring a specific type of installation work, pictures the major variations of electric and plumbing connections found in the industry.

A total of eight electric water heater installation methods as developed for use with one meter are shown, together with several adaptations of the two-meter method, and suggested plumbing diagrams. All installations covered utilize the standard two-element water heater, known as the NEMA standard.

The manual is available from Edison Electric Institute, 420 Lexington Ave, New York 17, N. Y., at 50 cents a copy.

Tennessee Co-ops Escape State Tax on Purchases

Electric cooperatives in Tennessee are exempt from the state's new 2 percent retail sales tax on purchases of tangible personal property if such property is used by the co-op. This was the ruling given State Finance Commissioner Sam Carson by the Attorney General's office. However, if a contractor buys such property for use on a co-op project, he must pay the tax the same as any other contractor. The exemption comes as the result of another law exempting co-ops from taxation.

Co-ops had complained that the tax would increase their line building costs. The co-ops are also protesting a "use" tax law which levies a 2 percent tax on goods bought outside the state for use within. No ruling has been made on this.

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Utility Connects with BPA

A 16-mile, 110-kv line from the Troutdale substation of Bonneville Power Administration into Portland has been completed by Pacific Power & Light Co. This is the first major permanent connection in the Portland area between the utility and Bonneville. The new line, which will operate initially at 66 kv, will supplant a temporary connection in West Vancouver, Wash.

Union Leaders Perturbed by State of Productivity

Leaders of organized labor have joined management in expressing concern over the low state of productivity.

In the electrical contracting industry, it is expected that a joint committee of the National Electrical Contractors Association and The International Brotherhood of Electrical Workers, AFL, will be named to study the problem of production costs after the NECA convention in San Francisco, September 8-10.

The industry already has designated this as the big problem to be considered by the convention. Marion H. Hedges, research director of IBEW, has suggested the idea of a productivity study with union cooperation.

NECA spokesmen indicate that it would be receptive to the suggestion. It might be accomplished through revival of the NECA-IBEW Labor-Management Committee, which has been inactive in recent years. This committee would go into the economics of the situation from the viewpoint of each side.

Hedges is vice-chairman of the National Planning Association's Labor Committee, which has issued a statement signed by 33 union leaders, both CIO and AFL. This statement recognizes that high wages stem from high productive efficiency, and that labor has as much a stake in higher productivity as management, consumers, and stockholders.

The committee asks for joint labor-management cooperation in improving productive operations, particularly in overcoming restrictive practices on both sides. Labor, it says, can make a significant contribution to increased efficiency, but management must lead the way.

The statement sets forth two general principles:

1. "Workers must have assurance that the cards are not being stacked against them."

2. "Passing on of the benefits of increased productivity must be equitable and reasonably clear and certain."

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Franchise Renewed

A 25-year franchise has been renewed with the Gulf States Utilities Co to serve Delcambre in Iberia Parish, La. The City Council adopted an ordinance levying an excise license tax on utilities of 2 percent of gross revenue other than from the city and industrial firms.

SEC RULINGS

SOUTHERN UTAH POWER Co has been authorized to sell privately its notes up to a maximum of $175,000, inclusive of $65,000 of notes now outstanding. Proceeds will be used to finance temporarily part of the company's construction program. (Release No. 7539).

ELECTRIC BOND & SHARE Co has obtained an extension of time to sell certain shares of the common stock of the Carolina Power & Light Co. The sale would facilitate consummation of its plan 11-A, filed in compliance with the Holding Company Act. (Release No. 7550).

ATLANTIC CITY ELECTRIC Co's proposal to borrow $1,800,000 from the Guaranty Trust Co and the same amount from the Irving Trust Co, both of New York has been approved. The money will be used to pay off an outstanding note and for construction. (Release No 7563).

MARYVILLE ELECTRIC LIGHT & POWER Co's sale of 13,712 shares of common stock to its parent, Continental Gas & Electric Corp, at $100 a share has been approved. To make the sale possible, Maryville will increase its common stock from 5,000 to 20,000 shares. Continental will pay $500,000 cash and make book adjustments for the remainder. The cash will be used for plant improvement. (Release No. 7578).

PENNSYLVANIA POWER & LIGHT Co and its subsidiaries have been dismissed as respondents in proceedings against Electric Bond & Share Co and National Power & Light Co, former parents. (Release No. 7580).

LOUISVILLE GAS & ELECTRIC Co, Ky., has been authorized to sell to its parent, Louisville Gas & Electric Co, Del., 34,864 shares of no par common stock at $25 a share. The money is to go in the treasury to replace funds used for construction. The Delaware company proposes to distribute its holdings in common stock of the Kentucky company, increased to 918,025 shares following above purchase, to its stockholders under terms of a liquidation plan. (Release No. 7584).

ELECTRIC BOND & SHARE Co has been authorized to set up an "accounting reorganization account" in amount of $460,571,000 to aid in program for conformance with Section 11 of the Public Utility Holding Company Act. Electric Bond proposes to allocate $280,000,000 from this account to investment reserve as follows: United States utilities, $80,000,000 and foreign utilities, $200,000,000. Remainder would be transferred to a capital adjustment and contingency reserve. The company said further that the accounting reorganization is necessary because of its joinder in the plan of reorganization of American & Foreign Power Co, a subsidiary. (Release No. 7586).

PUBLIC SERVICE CO OF NEW MEXICO has been authorized to borrow $1,000,000 from Irving Trust Co, New York, on a 2 percent promissory note maturing in nine months. (Release No. 7593).

WISCONSIN PUBLIC SERVICE CORP has been granted permission to purchase all of the 240 shares of issued and outstanding capital stock of Coleman-Pound Light & Power Co. The utility has been purchasing electric energy from Wisconsin and serving 335 customers in Pound and in Coleman, Marinette County, Wis. Shares are to be bought at $254,23 for a total of $61,015.20. When all stock is acquired by Wisconsin, Coleman-Pound will be dissolved. The $41,891 in excess of the value of the stock as found by the Public Service Commission of Wisconsin will be charged to Wisconsin's earned surplus account. (Release No. 7594).

MEETINGS

American Institute of Electrical Engineers—Middle Eastern District Meeting, Biltmore Hotel, Dayton, Ohio, September 23-25; Midwest General Meeting, Congress Hotel, Chicago, November 3-7. H. H. Henline, secretary, 33 W 39th St., New York 18, N. Y.

Pennsylvania Electric Association—Transmission & Distribution Committee, Fort Ligonier Hotel, Ligenier Pa., October 16-17. C. C. Farrell, chairman, Philadelphia Electric Co., 1000 Chestnut St., Philadelphia 5, Pa.; Prime Movers Committee, Benjamin Franklin Hotel, Philadelphia, October 23-24. R. L. Hallman, chairman, Pennsylvania Power & Light Co., Hazleton, Pa.

Previously Listed

American Institute of Electrical Engineer—Pacific General Meeting, San Diego Hotel, San Diego, Calif., August 26-29.

American Society of Mechanical Engineers—Fall Meeting, Hotel Utah, Salt Lake City, September 1-4.

Rocky Mountain Electrical League—Annual Convention, Townsend Hotel, Casper, Wyo., September 4-6.

National Electrical Contractors Association—Annual Meeting, Palace Hotel, San Francisco, September 8-10.

Instrument Society of America—Second Annual Conference and Exhibit, Stevens Hotel, Chicago, September 8-12.

Illuminating Engineering Society—Technical Conference, Roosevelt Hotel, New Orleans, September 15-19.

Indiana Electric Association—Annual Convention, French Lick Springs Hotel, French Lick, Ind., September 17-19.

International Association of Electrical Inspectors—Northwestern Section, Eugene Hotel, Eugene Ore., September 22-24. Southwestern Section, Mission Inn, Riverside, Calif., September 29-October 1.

Association of Iron and Steel Engineers—Annual meeting, William Penn Hotel, Pittsburgh, September 22-25. T. J. Ess, managing director.

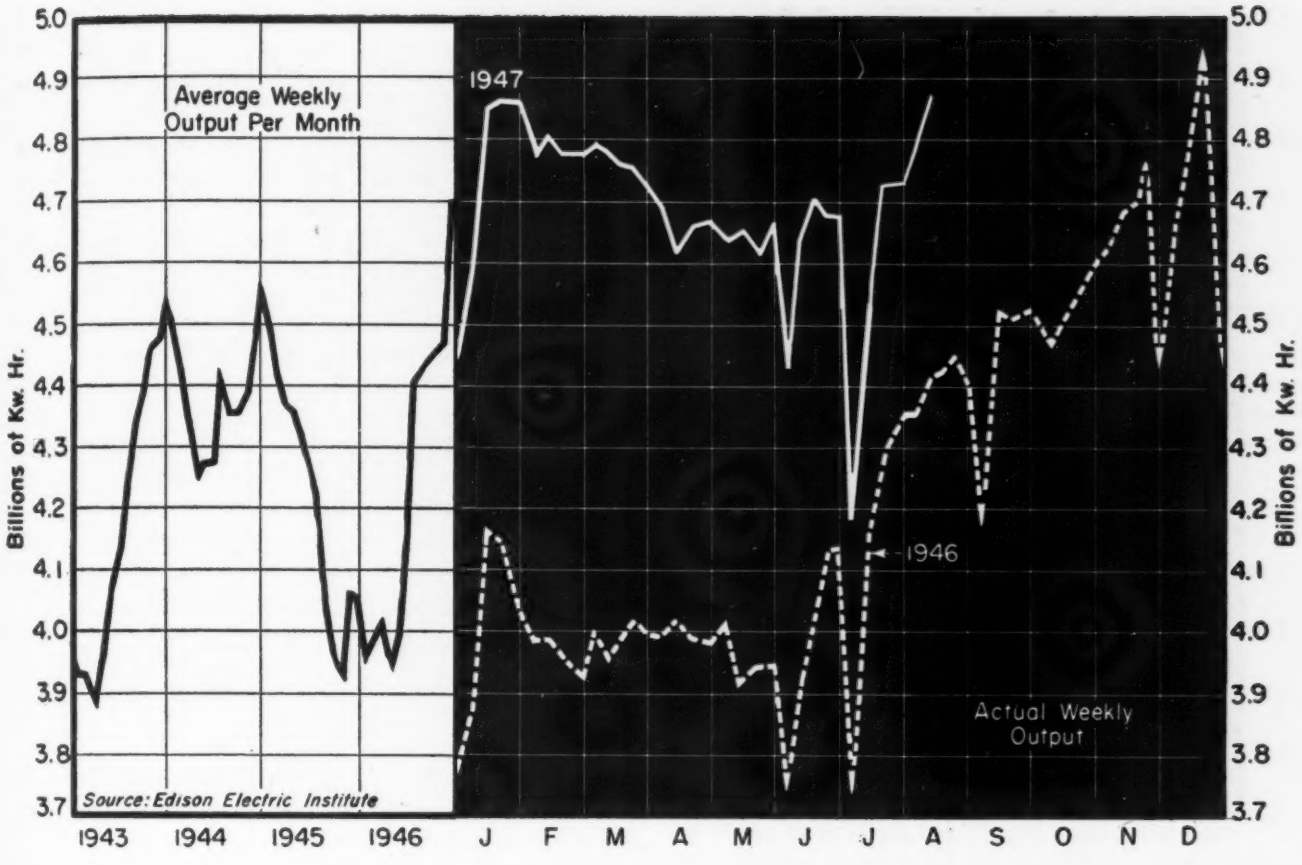
National Research Council—Conference on Electrical Insulation, Massachusetts Institute of Technology, Cambridge, Mass., September 24-27.

Fluorescent Lighting Association—First Annual Cold Cathode Fluorescent Lighting Exhibit, Commodore Hotel, New York, October 7-9.

National Farm Electrification Conference—Clayton Hotel, Indianapolis, October 7-8.

International Association of Electrical Leagues—Annual Conference, Statler Hotel, St. Louis, October 8-11.

American Standards Association—Annual Meeting, Waldorf-Astoria Hotel, New York, October 21-23.



Regional Groups to Allocate Short-Wave Frequencies

Regional committees to coordinate the allocation of short-wave frequencies among electric and gas utilities have been established by the two industries to work in cooperation with the Federal Communications Commission.

Representatives of both public and privately owned electric utilities will serve on the regional bodies, FCC announced.

Chairmen of the new committees are: R. W. Lewis, Boston Edison Co., Area I, including Maine, New Hampshire, Vermont, Massachusetts and Connecticut; C. S. Young, Pennsylvania Power & Light Co., Area 2, New York, New Jersey, eastern Pennsylvania, Maryland, Delaware and District of Columbia; J. G. McKinley, West Penn Power Co., Area 3, western Pennsylvania, West Virginia, Kentucky, Illinois, Indiana, Ohio, Wisconsin and Michigan; H. W. Chew, Empire District Electric Co., Area 4, North and South Dakota, Minnesota, Nebraska, Iowa, Kansas, Missouri and Arkansas; T. G. Humphries, Jr., Birmingham Gas Co., Area 5, Virginia, Tennessee, North and South Carolina, Mississippi, Alabama, Georgia, Louisiana and Florida; Paul Taylor, Central Power & Light Co., Area 6, Texas; C. T. Malloy, Southern California Edison Co., Area 7, California, Nevada, Arizona, New Mexico, Colorado and Wyoming; W. A. Leidigh, Portland General Electric Co., Area 8, Washington, Oregon, Idaho, Montana and Utah.

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Signs For More Power

Craighead Electric Cooperative Corp., which now buys most of its power from Arkansas Power & Light Co., has signed a contract for additional power from Arkansas-Missouri Power Corp. This power will be used in seven counties, and cost will be about 1 cent a kwhr.

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Wickenden Named

W. E. Wickenden, past-president of the American Institute of Electrical Engineers, has been appointed by the Engineers Joint Council to represent the Institute on a five-man advisory committee formed at the request of the State Department to advise it when called on.

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Other News

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Output Hits New '47 High

The electric output curve swung upward during the week ended August 9, 1947 to a new high for the year, according to figures released by the Edison Electric Institute. The amount of electrical energy distributed by the light and power companies totaled 4,874,172,000 kwhr, comparing with 4,805,740,000 kwhr during the preceding week. This was the highest weekly total since the week ended December 21, 1946, when the output totaled 4,940,453,000 kwhr. During the week ended August 10, 1946, the amount of electrical energy distributed amounted to 4,411,717,000 kwhr.

Weekly Output, Millions Kwhr

1947		1946		1945	
Aug. 9	4,874	Aug. 10	4,412	Aug. 11	4,395
Aug. 2	4,806	Aug. 3	4,351	Aug. 4	4,432
July 26	4,730	July 27	4,352	July 28	4,435
July 19	4,372	July 20	4,293	July 21	4,385
July 12	4,531	July 13	4,156	July 14	4,295
July 5	4,190	July 6	3,741	July 7	3,978
June 28	4,675	June 29	4,133	June 30	4,353
June 21	4,676	June 22	4,129	June 23	4,358
June 14	4,702	June 15	4,030	June 16	4,348
June 7	4,635	June 8	3,920	June 9	4,327
May 31	4,429	June 1	3,741	June 2	4,204
May 24	4,663	May 25	3,942	May 26	4,330

Percent Change from Previous Year

	Aug. 9	Aug. 2	July 26
New England	+ 3.7	+ 2.7	+ 3.9
Mid-Atlantic	+ 5.8	+ 6.6	+ 3.5
Central Industrial	+11.5	+11.0	+ 9.3
West Central	+12.3	+ 9.8	+ 8.2
Southern States	+10.4	+ 9.7	+ 8.1
Rocky Mountain	+10.0	+15.0	+13.2
Pacific Coast	+16.1	+17.1	+15.3
Total United States.	+10.5	+10.5	+ 8.7

Electrical World
OPINION

Dog Days Don't Stop Planned Lighting

HOT WEATHER brings lassitude, vacation absences of key men, the usual slowing-up of business. A less favorable time, apparently, could not have been chosen to launch the "Planned Lighting Program."

Favorable time or not, the program certainly is digging in for a good start on a long run. Up to August first, only one of the five plan books had been sent out, that on store lighting. Orders for the sales material—mailing pieces, handouts, visualizers, layout forms, etc—began to come in as soon as the books were delivered.

"This material rings the bell," wrote one power company, ordering quantities of it for a store lighting sales push next month. Another company telephoned its order the day the plan book was received. Already, nearly half of the first printing of the store lighting sales material has been spoken for.

Coincident with official announcement of the program last March, an article on it was published in ELECTRICAL WORLD. In following weeks, many requests for more information were received. One came from as far away as South Africa. Others came from South America, England and France, as well as from this country. A more comprehensive preview of the program appeared in ELECTRICAL WORLD July 19. In less than three weeks, a stock of 2350 reprints was exhausted.

Is the idea of planned lighting taking hold? These evidences prove that it surely is. The indications are that it is taking hold, not only among the sellers, but among the buyers; not only in this country, but in other parts of the world.

This Farm Electrification Was Bought, Not Sold

HE is an up-and-coming citizen, this particular farmer. He has had electric service at his place for quite a few years. In his home are an electric range, a refrigerator, a food freezer and a number of small appliances, as well as plenty of lights. A pressure water system supplies his house and barn. For handling baled hay, sacked grain and other heavy stuff, he recently built a motor-driven elevator with parts picked up here and there. But his largest dependence for power is on his two tractors, a big one and a little one, each of which his ten-year old son operates with expert ease.

"Does the power company man come around once in a while to tell you about farm electric applications and help out with power problems?"

"No," he replied. "I don't see anyone from the power company from one year's end to another, except to say 'Hello' to the local manager if I meet him in town."

"Does the company send you information on electric equipment and uses by mail?"

"No, all I get by mail is the bill."

"How is it, then, your home is so well equipped electrically? What started you to build that elevator? Who sold you all this stuff?"

"Nobody sold it to me. I bought it. And I got the instructions for the elevator out of a magazine."

This is not fiction. The farmer interviewed lives in a prosperous agricultural region. He is served by a power company recognized as among the leaders in farm electrification. Neither he nor the company will be identified now or later because to do so will do no one any good. But we wonder—and will never know—how many power companies, and cooperatives, too, can identify themselves in the frame of this picture. One thing the picture shows, one thing that's generally known, is that there are not nearly as many men as there should be traveling the country roads selling farm electrification.

On Uniform Regulation

MEMBER Leland Olds of the Federal Power Commission believes it would be wise to extend federal accounting control to all electric utilities. This Mr Olds testified recently. He felt the uniformity this would bring would be desirable.

Without much doubt, there are many aspects of utility regulation which would profit from national uniformity. Electric utilities have sought uniformity with federal power systems for years. They ask uniformity of interest, taxes and regulation. We can't see that such uniformity would harm the customers. Doubtless, it would tarnish some annual reports federal systems turn in.

Of course, attempts have been made to reach accounting uniformity. The National Association of Railroad and Utilities Commissioners has adopted a Uniform System of Accounts quite similar to FPC's. Many member commissions use it. But U. S. representative government being what it is, many legal and constitutional complications beset those who would grasp the very real fruits of uniformity. Were this not true, Mr Olds certainly would have carried his point to its logical end and urged nationally uniform regulation of all rates. Philosophically, much could be said for this idea. Politically, it is not in sight.

Those who would achieve uniform regulation, though,

should go to Congress. Had it always gone to Congress in its efforts to achieve uniformity of regulation, FPC probably would not face the Miller bill problem. For some years, FPC tried to extend accounting uniformity in the electric utility industry by expanding its jurisdiction more and more broadly. It was very successful in this attempt. It won much Supreme Court approval for its conception of the Federal Power Act. Many utility people feel that FPC won, by litigation, jurisdiction Congress declined to give it in legislation. A lot of state regulators agree. So do some members of Congress. That is precisely what the fight is all about on the Miller bills.

Mr Olds was the leader of that FPC drive. Today, his successor, Chairman Smith, must defend a position he did not make. Mr Smith seems to feel he must condemn compromise on relaxing the Federal Power Act. To ask FPC compromise, he says, is like asking FPC to help compose its own eulogy. This might well be true if it applied solely to amendments to specific, clear provisions of the Federal Power Act. It certainly is not true when applied to amendments which would repeal interpretations of the Act which were made by FPC and validated only by the courts. In effect, Mr Smith insists that the Jersey Central and Hartford Electric decisions are fine and must not be questioned. This is an insistence upon a non-legislative validation of FPC. We do not believe that any such sweeping validation is right; but if it come, it should be a legislative validation, not a negative endorsement by default.

(It is distressing to see Chairman Smith adopting this position. Many disagree with it, and they are unlikely to change their minds merely because FPC feels it must hold its lines. We hope this insistence will not imperil the reconciliation between the industry and FPC. We fear that it may.)

FPC, of course, has every right to its position. One day, it will win or lose, and that problem will have been settled. However it be resolved, we hope that the troubles it has brought FPC, and the needlessness of it all, will be recalled the next time temptation arises to achieve uniformity other than by legislation.

Coal Comfort

THERE is nothing new about the electric power industry's tradition of stockpiling fuel supplies well ahead of the need for them. It is a conservative operating practice of a conservatively operated industry. Its benefits are so real, indeed, that the industry might well be criticized if it failed to stockpile vigorously. Thus, there is no particular praise coming to the industry for its accumulation of 84 days' supply on last July 1. But, recalling the imminence of a bituminous coal strike then, it certainly is comforting to learn that the industry had pushed its coal stocks to a two and one-half year high.

WASHINGTON COMMENT

By R. N. LARKIN

CONSULTING ENGINEERS, particularly including the electric power industry's numerous service organizations, should find one of the brightest facets of our brave new world in the International Bank for Reconstruction and Development.

Strictly speaking, the bank has been in business for some time. Its status became even more tangible recently when the financial community fell all over itself to snap up the $250,000,000 bond issue—its first—which the Bank put out hopefully.

The Bank's particular attractiveness to consulting engineers is easily explained. Total authorized capital is $10,000,000,000, of which participating governments will put up $2,000,000,000 in cash, pledging themselves to guarantee Bank funds for another $8,000,000,000. The other $8,000,000,000, however, is scheduled to be raised in the money markets of the world. Since it must compete for the capital it would lend, the Bank, obviously, is a business bank, not a relief organization. Its loans must be business loans, showing some reasonable hope of profitable amortization; otherwise the capital with which to make them will not be forthcoming.

Since its loans must be sound, and since it is not anticipated that any of them will be made in the United States, there will, of necessity, be considerable investigation of the projects which would-be borrowers bring into the bank for financing. The nature of the projects for which loans have been sought thus far is such as to require competent engineering organizations to study proposed projects. The Bank itself does not anticipate establishing its own investigative staff, at least not in the strength which will be required if its full capital ever be used.

Of course, foreign engineering talent will be in the competition as well, but during its early history, the Bank will face a more or less compelling reason for using American talent widely. That is the fact that, so far, the Bank is only in the business of lending dollars. Its capital is to be subscribed in many currencies, and Bank issues will be floated in other countries whenever possible—assuming that the day arrives when the world will want to borrow other currencies. Today, the world wants dollars, and that's all the Bank can lend. American judgment, then, of the economics of projects seeking American dollars would seem to have an inherent attractiveness the Bank will find it hard to overlook. Of course, the management of the Bank is distinctly international. But the United States has a real voice in it. Thus, it may be assumed safely that the U. S. representatives on the Bank's management staff will be happy to have the judgment of American engineers regarding Bank loans.

OUTDATED LIGHTING EQUIPMENT cuts visibility and results in increased traffic accidents and fatalities. Before the relighting campaign, Lower State St presented this highly dangerous appearance because of inadequate illumination

Capital City Takes the Lead

C. E. WALDRON
New York Power & Light Corp
Albany, N. Y.

CITY OFFICIALS of Albany became light-conscious in 1938, when they discovered, after a study of conditions, that dimly lighted streets were the direct cause of many night-time traffic accidents and fatalities as well as a good breeding ground for crime. They then took the initial steps towards relighting their city for safety and beauty.

It was evident from tests that certain heavily traveled areas were in immediate need of better lighting. Plans were approved for the first modern installations, as recommended by the IES Code for Street Lighting. These were on the business sections of South Pearl St, Clinton Ave and parts of North Broadway, Washington and Central Aves.

The improved lighting earned enthusiastic approval. It stimulated plans for enlargement. The war intervened, however, before these plans could come to fruition, and it was not until 1946 that the city's lighting problem again received serious consideration.

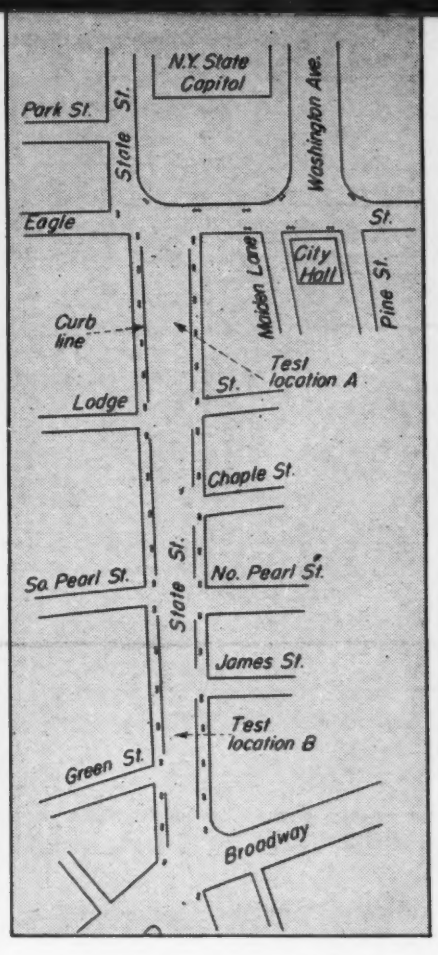
At the close of the war, with the lifting of gasoline rationing, and of speed controls, plus deterioration of lighting equipment due to war-time restrictions, the problem became critical. Traffic, both local and through, always heavy in a capital city, was expected to top the record high of 1941, and with it would come an unprecedented increase in traffic accidents and fatalities. Aware, as many forward-looking city planners now are, of the unnecessary number of deaths directly attributable to poor visibility on the streets and highways at night, city officials determined to eradicate this element of their safety problem.

Relighting downtown State St from Broadway to Eagle St was given first place on the agenda. State St, because of its width, proved a difficult thoroughfare to light properly. The street is 68 ft wide at its lower end, and broadens to 104 ft at Eagle St, with three important crosstown intersections. This street, with the Plaza at its Broadway end, and topped by Capitol Park leading to the State Capitol Building, has been called by Martin Brunner, city-planning expert, one of the most beautiful in the world.

The outdated equipment consisted of 45 twin-light standards having two 6,000-lumen pendant fixtures, with clear diffusing globes and no reflectors. The mounting height was approximately 20 ft to light center and units were spaced about 80 ft apart.

The modern equipment utilizes 47 twin-light standards with two 15,000-lumen (860-watt multiple) fixtures per standard, having a mounting height of 30 ft to light center, spaced as originally. These twin-light fixtures with a symmetric distribution of

NEW FIXTURES on Lower State St give a symmetric distribution of light



NEW 30-FT STANDARDS with 15,000-lumen lamps, replace 21-ft standards with 6,000-lumen lamps, as shown on map. New standards are parallel to curb

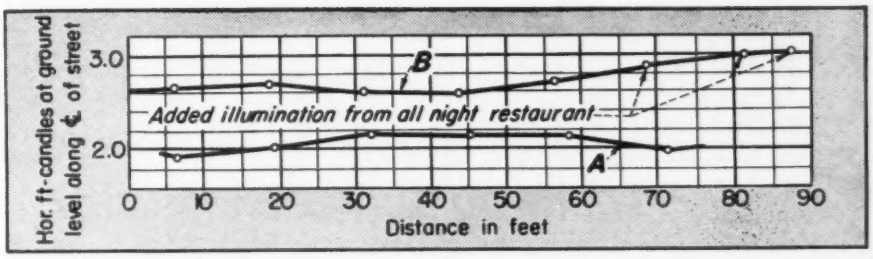
in Modern Street Lighting

light, were installed parallel to the curb line to give an average of 2.5 ft-c on the street, about five times that provided by the old system. Note the greater height of the new fixture in comparison with the old in an accompanying illustration.

Photometric tests showed, at the widest part of State St, a centerline average foot-candle value of 2.05 and, at the 76-ft section, 2.76, with excellent uniformity of illumination.

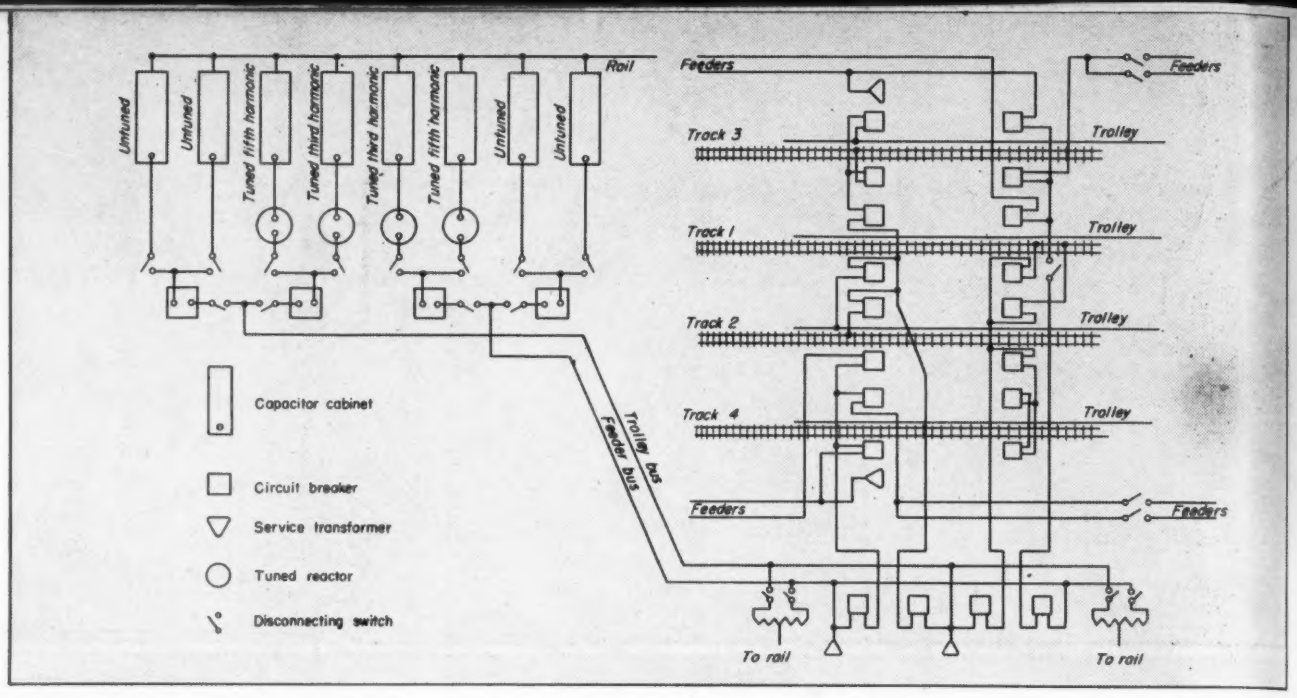
A graphic illustration of what the new lighting on State St means to Albany can be seen by comparing the "before" and "after" views. Parked cars now appear clear-cut and easily visible to the passing motorist, while pedestrians several blocks away can be plainly seen. Bus stops and crossings are adequately illuminated, and sidewalks are well lighted for the protection of evening shoppers.

Part two of Albany's plan includes the modernization of equipment on upper State St from Eagle St to Robin St, and Washington Ave from Eagle to Robin. These streets are parallel, a block apart, and extending past the State Capitol and State Office Buildings from downtown Albany to State Teachers' College, a total of 14 blocks of business and traffic streets.



AT LOCATION A, indicated on map, test showed average intensity of 2.05 foot-candles and 2.76 at location B. Street widths are 102 and 76 ft, and lamp standard spacings are 76 and 88 ft, at A and B, respectively

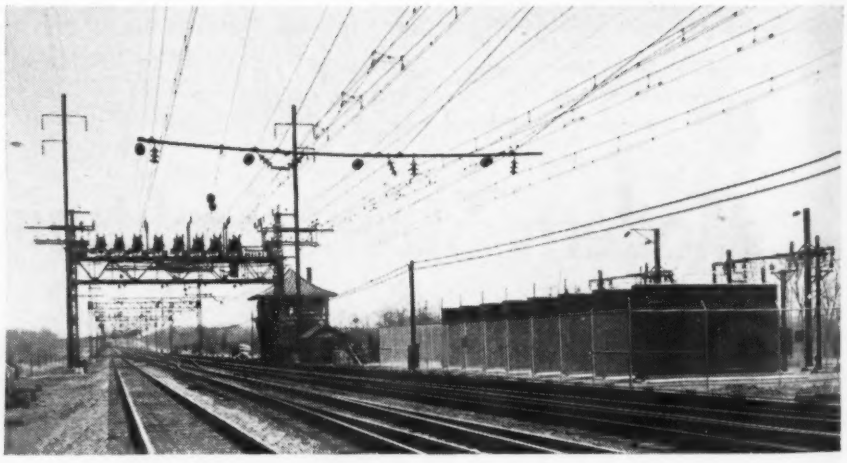
Upper State St is 36 ft wide, and the pendant luminaires are staggered 150 ft apart. The new luminaires on Washington Ave—a 50-ft street—are spaced 100 ft apart, and they, too, are staggered. In both cases, the mounting height to light center is approximately 28 ft. On one of the 14 blocks, 10,000-lumen incandescent lamps are used, the remaining five blocks have 6,000-lumen lamps. Because of the mounting height, glare has been reduced to a minimum, with resulting satisfactory distribution of light and adequate visibility. It is estimated that the average intensity is 0.8 ft-c on wide streets to 1.2 ft-c on the narrow blocks. Intersections have lights located diagonally on opposite corners.



CONTROLLED KILOVARS, 10,000 in 1,694 units, hold voltage on New Haven Railroad electrification

Capacitors Improve Traction Voltage

SIDNEY WITHINGTON
Chief Electrical Engineer
The New Haven Railroad



CAPACITOR BANK BOOSTS VOLTAGE at New Haven end of electrified railroad

ON MARCH 14th the New Haven Railroad placed in operation a 10,000 kvar bank of capacitors on its electric traction circuits at Woodmont, Conn., about six miles west of New Haven. This is believed to be the largest installation of capacitors on a 25-cycle, single-phase system.

The railroad's power distribution network is a three-wire system at 11,000-22,000 nominal voltage, 25 cycles, with trolley and feeder phases 180 deg apart and the rails as the neutral. At the Woodmont substation there is a pair of balancing autotransformers connected across the trolley and feeder buses and rated at 2,000 kva each, as indicated on the accompanying diagram. The transformer buses were extended and connected with the capacitor banks as shown.

Comprising the capacitor installation are 1,694 units of 15 kvar each at standard 60-cycle rating, which at 25 cycles becomes 6.25 kvar. These units are placed in eight separate banks as shown, each housed in a weatherproof cabinet, approximately 20 by 4 by 12 ft of sheet steel properly ventilated.

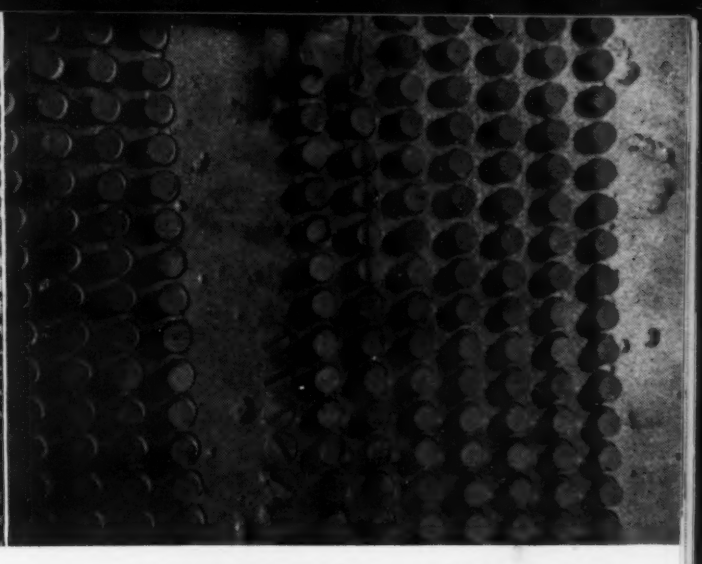
Arrangement is symmetrical and nearly similar for the trolley-rail and feeder rail circuits. In each instance two capacitor banks are connected directly and two are connected through oil-insulated, self-cooled tuning reactance coils in series for filtering out third and fifth harmonics. Each pair of banks in parallel is controlled by a single circuit breaker.

Since it is desirable not to permit line voltage to rise above 12,000 the control of the capacitors is arranged so that if light load conditions produce voltages too high with all the banks in service, the banks may be cut out in four different operations. The first groups which are cut out on account of high voltage are the untuned groups on trolley and feeder circuits. If the voltage continues too high, the tuned groups are then cut out automatically. Conversely, when low voltage occurs the tuned groups are automatically restored and then the untuned groups, one at a time.

This control is accomplished by voltage relays operating with time-delay relays with separately adjusted contacts so the time setting may be varied as found desirable. There are provided also the usual differential and overload protection relays operating in conjunction with the line circuit breakers of the existing transformer station.

The tuning reactor coils are rated at 37.5 ohm for the third harmonic filter (75 cycles) and 20.5 ohm for the fifth harmonic filter (125 cycles).

APPLYING METALLIZED COATING to condenser tube sheet. 50-50 solder is applied with metal spray gun



ENDS OF CONDENSER TUBES are plugged with rubber stoppers during grit blasting to prevent damaging tubes

Solder Stops Steel Tube-Sheet Corrosion

E. R. STAUFFACHER
Electrical Engineer
Southern California Edison Co
Los Angeles, Calif.

ALTHOUGH THE PROBLEM of corrosion of steel condenser tube sheets at the Long Beach steam plant of Southern California Edison Co., Ltd., has not been entirely solved, nevertheless, methods tried and experience gained should prove of value to those interested in corrosion problems. The situation arises from the fact that during the war it was necessary to accept from the manufacturer mild-steel tube sheets for the condenser in place of brass usually supplied for sea-water service. Aluminum-brass condenser tubes, steel tube sheets and circulating sea water made an ideal combination for corrosive and electrolytic action.

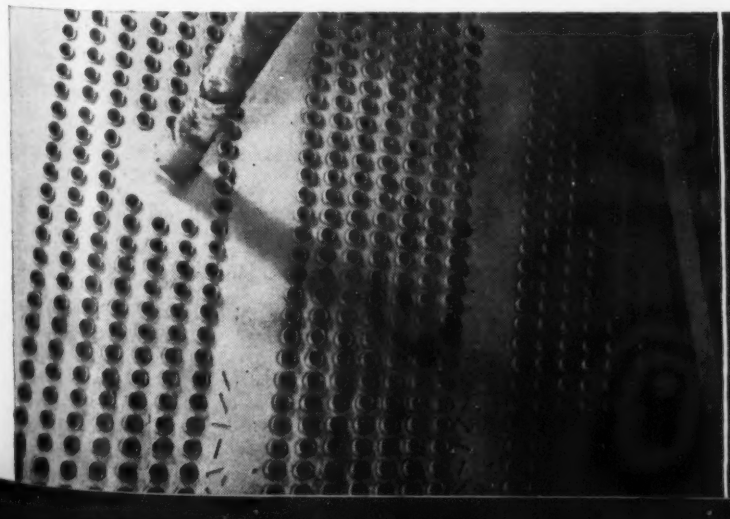
To prevent corrosion, several types of protective coatings have been applied to the tube sheets. As a result of experience gained in using lead, tin, zinc, monel, 50–50 solder (50 percent tin-50 percent lead) and several kinds of organic coatings, it appears that 50-50 solder gives best results for the particular condition encountered. At the time of the last overhaul, 50–50 solder was applied throughout. It has also been observed that organic coatings applied over the sprayed metal help considerably in controlling and minimizing corrosion.

On this basis, the 50-50 solder applied was covered with several coats of organic protective coatings. No coating of the several tested showed such outstanding performance as to justify its exclusive use, so several different coatings are being used at present to determine relative performance.

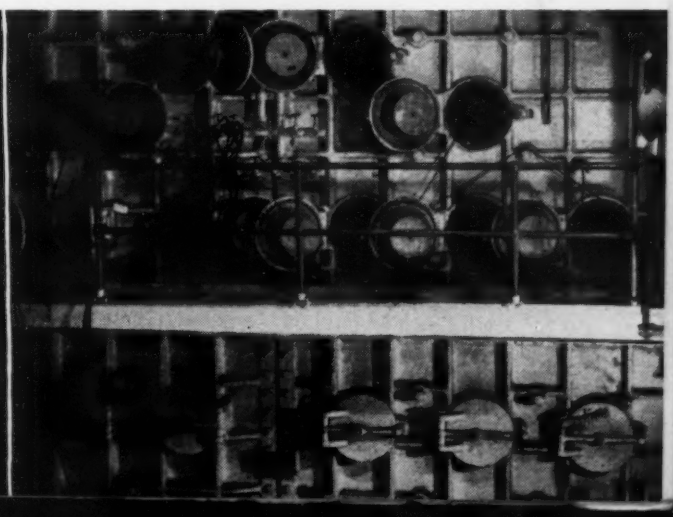
The 50–50 solder was applied by metal spray gun after the surface had been thoroughly cleaned with carbon tetrachloride to remove grease, etc. followed by grit (metal) blasting at approximately 100 psi air pressure. Standard $\frac{1}{8}$-in. round wire 50–50 solder was then applied by the metal spray gun to a thickness of 30 to 40 thousandths of an inch, determined by preliminary tests on steel plates by checking with a micrometer. In addition to the solder and paint coatings described, cathodic protection is also used to minimize galvanic action. This is accomplished by using circular zinc plates 1 ft in diameter and $\frac{1}{2}$ in. thick, mounted on the inside of each manhole door. No effort was made to put potential on the cathodic protection as provision had not been made for this when the condenser was built.

It is expected that the solder coating will last a matter of two or three years at least.

AFTER metal spraying with 50-50 solder. The solder was applied to a thickness of 30 to 40 thousandths of an inch

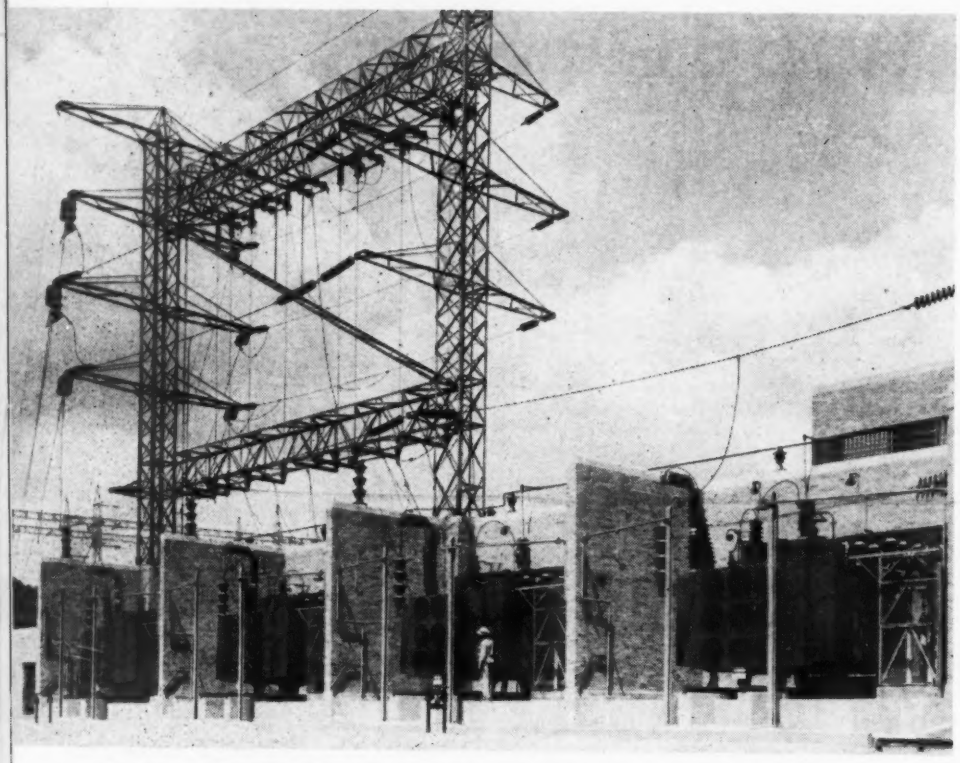


PARTIAL VIEW of end of condenser showing zinc plates on manhole covers used as supplementary cathodic protection

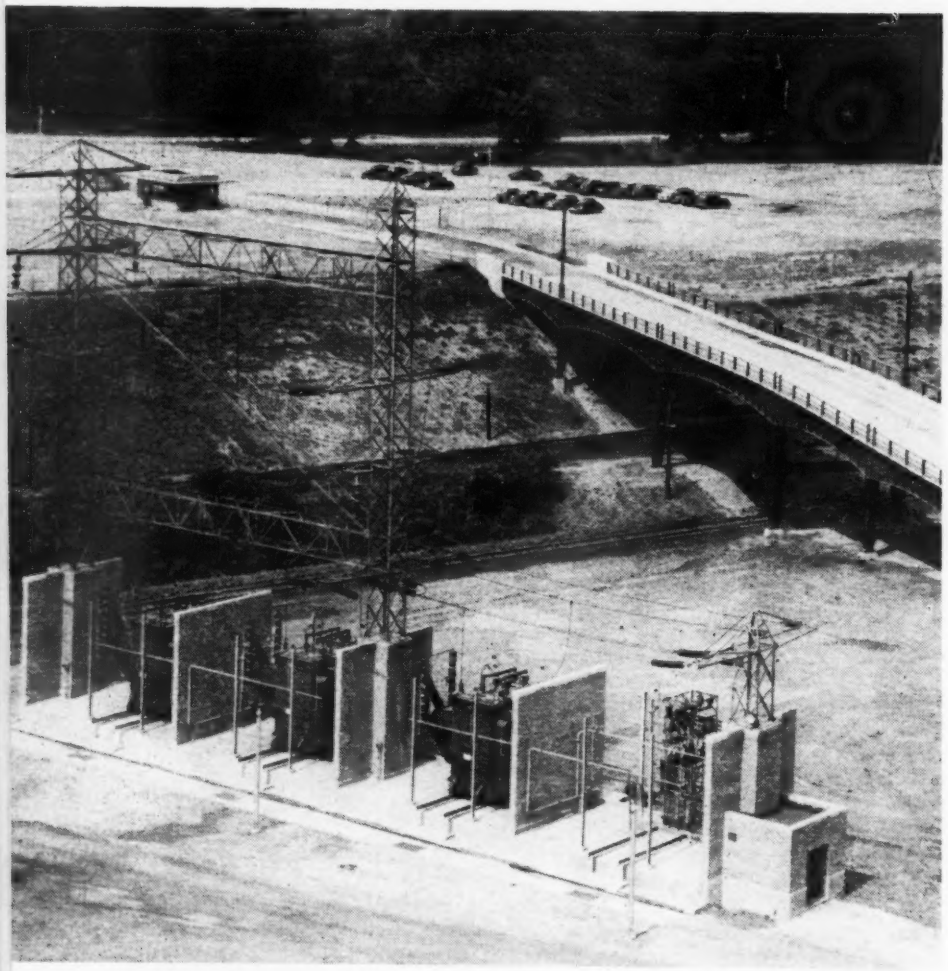


Tidd Plant

FREDERIC A. LANE
Electrical Engineer
American Gas & Electric Service Corp



MAIN TRANSFORMERS force-cooled and protection by carbon dioxide installation



AUTOTRANSFORMERS (3 of 105 Mva, 132/66 kv) in switchyard across tracks from generating station

DISTINCTIVE electrical features of the generators and transformers in the Tidd Plant* are the following: (1) Use of a double-winding generator; (2) auxiliaries supplied either (a) directly off generator or (b) from incoming bus; (3) main transformers have (a) welded-on covers, (b) compactness achieved through reduced insulation and high permeability cores, (c) forced cooling and comprehensive fire-extinguishing installation.

Basic Scheme

Schematically, the electrical installation follows the elementary one-line diagram, Fig 1.

The double-winding generator is connected by a short route to three single-phase transformers stepping up to 132,000 volts, where a single breaker provides ample switching. When the plant expands, a second breaker will connect the unit to the future No. 2, 132-kv bus.

Auxiliary power is obtained from two sources. The normal source of supply is directly from the generator leads through two transformers; one on each winding. Each transformer, serves an independent 2,300-volt bus. There is provision for quickly connecting the two buses by cable, should need arise. For emergencies and for starting and stopping periods two reserve auxiliary transformers supply the two 2,300-volt auxiliary buses from the 66,000-volt bus. These latter are station transformers which will serve the same purposes for future units and will not be duplicated as the plant expands. Smaller 550-volt auxiliaries are served from four bus sections tied together by breakers in a ring. Each section is served by a transformer stepping down from the 2,300-volt buses.

The 1,800-rpm, hydrogen-cooled

* The steam-end features were discussed in article "Tidd Generating Station Is Both Efficient and Economical" in ELECTRICAL WORLD, August 2, 1947.

Electrical System Advances New Ideas...I

Dual auxiliary supply; hydrogen-cooled generator; gas-filled cables lead to transformers . . . Transformer size minimized by forced-cooling, reduced insulation and high permeability cores

generator is rated 111,111 kva at 0.9 power factor and ½-lb hydrogen pressure with an ancillary rating at 15-lb hydrogen pressure of 128,000 kva at 0.87 power factor. It has a short-circuit ratio of 0.9 at the ½-lb hydrogen pressure rating. The stator frame is built up of steel plates and rolled members to form a housing for confining the cooling hydrogen. It has a Class B insulated stator winding of the transposed bar type in two parts, each connected wye for 13,800-volt operation. There are twelve imbedded temperature detectors located between upper and lower armature coils in slots with different phases where highest temperatures may be expected. Eight other detectors measure gas temperatures and a temperature recorder is connected by pilot brushes to the rotor. The rotor, with fans attached to each end, consists of a conventional single steel forging with the windings in milled out slots. Four surface type coolers for use with 90-F water are installed longitudinally so that the water boxes extend beyond the end shields, allowing convenient cleaning of coolers without loss of hydrogen. All leads and pipe connections enter the bottom of the housing at the collector ring end, with pipes for admitting either carbon-dioxide scavenger gas or hydrogen so located as to distribute the gas evenly throughout the length of the machine. A detector warns of leakage of oil or water into the housing.

Exciters

The six-pole, totally enclosed, direct-connected main and pilot exciters, rated 300 kw and 4 kw, respectively, at 250 volts, are located on an overhung shaft and have their own closed circulating air system, with surface air cooler and filter. Two temperature detectors are provided for the main exciter. A temperature alarm relay monitors the cool air as it enters. The independent shunt field of the main exiter is excited from the compound wound pilot exciter through a motor-operated rheostat.

All hydrogen equipment, with the exception of the control panel, is located below the machine in the conventional "iron horse" common to installations of recent years. The sheet steel control cabinet is rubber mounted in the control room to eliminate vibration. It supports cool gas temperature indicator with alarm, pressure gages for ½ and 15-lb service, vacuum tank gage, hydrogen purity indicator with alarm, and differential fan pressure gage.

The generator, with the turbine, is supervised by remote indicating eccentricity recorder, vibration recorder, and electric tachometer at the central switchboard in the control room.

Regulation on the 132,000-volt bus is effected by an exciter field rheostatic type regulator with high-speed features, which receives its impulses from the unfused 25-kv insulated potential transformers on the generator leads through suitable compensator equipment.

Impulse Protection

All impulse protective devices, disconnecting switches and instrument transformers associated with the generator leads are installed immediately adjacent to the machine terminals. Lightning protection consists of 12-kv arresters and 13,800-volt capacitors with 23-kv insulators. Here, also, the delta connections for the main transformer bank, as well as connections to the auxiliary transformers, are made. Between this point and each main transformer terminal are in-

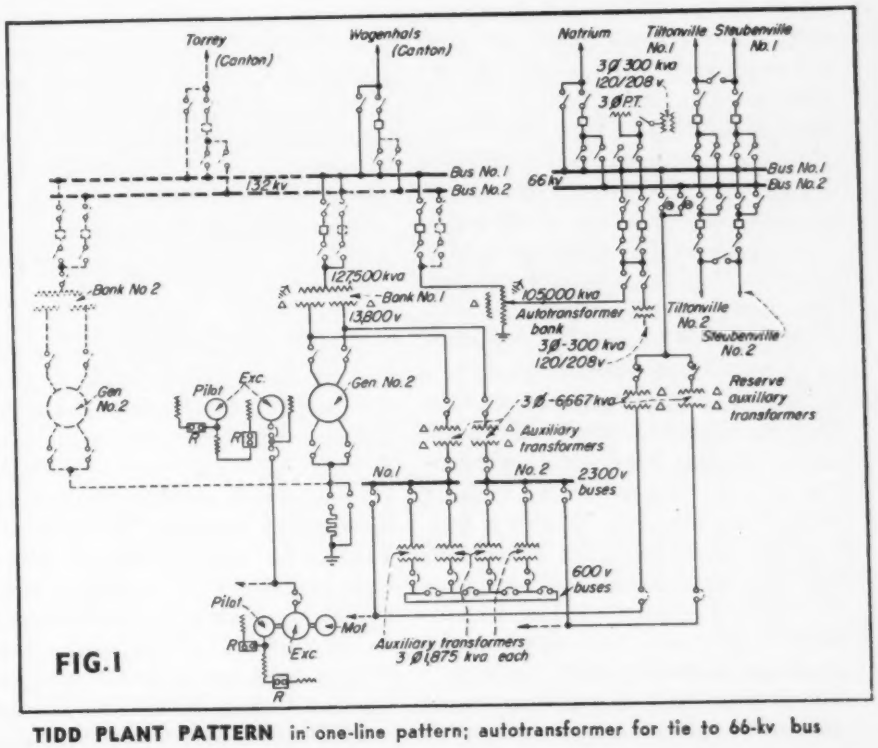


FIG.1

TIDD PLANT PATTERN in one-line pattern; autotransformer for tie to 66-kv bus

stalled two 1,250,000-cir mils gas-filled cables per phase. These are paper insulated for 17,000-volt service and sheathed with lead which retains the nitrogen gas under constant pressure. This continues practice initiated at Twin Branch where this type of cable was first pioneered for generator leads. Cables to the auxiliary transformers are also gas-filled, there being one 300,000-cm, 3-conductor, paper-insulated, lead-covered, 17,000-volt cable to each transformer.

Neutrals of the two windings are connected together through disconnecting switches and the common point is in series with a resistor to ground. The resistor, insulated for 8,000-volt operation, has a resistance of 11 ohms and is designed to carry 727 amp for two minutes with a temperature rise of 500 C. It allows passage of sufficient current for proper relay operation and at the same time that it limits fault current through the generator to ground, it limits the voltages to which the generator windings may be exposed.

Generator Transformer Bank

The four main transformers (including the spare) are rated 42,500 kva, single phase. They are connected in delta on the 13,800-volt windings and wye at 132,000 volts. Of the most modern forced-oil, forced-air-cooled type of streamline design, they are materially smaller and lighter than units of equivalent capacity of only a few years ago. Each weighs slightly less than 100,000 lb and occupies a floor space only 163 in. by 180 in. They are 134 in. high over the case and addition of bushings and arresters gives an over-all height of 179 in.

The high-tension windings are designed with 115-kv class insulation. The ungapped 115-kv bushing, however, has a 132-kv outside porcelain to give sufficient clearance to protect against flashover from accumulation of dirt. The grounded end of the 132-kv winding has 46-kv class insulation and an ungapped neutral bushing of that rating. This winding is protected by a 109-kv and a 50-kv rated lightning arrester on the line and neutral ends, respectively. The 13.8-kv winding using 25-kv class ungapped bushings is in two parts, each connected delta, to match the two windings of the generator.

Each transformer has an inert gas cushion and, to eliminate the usual gasket, the cover is welded to the tank. The two cooling units of a transformer each consist of a bank of air to oil, fin-type, tubular coolers, a 220-volt, single-phase, motor-driven, oil-immersed pump, two banks of single-phase, 220-volt fans, and a 230-volt, single-phase operating transformer installed inside the main tank. One operating transformer can carry the entire pump and fan load of a transformer. If desired, valves may be used to cut out either cooler assembly and with one set of cooling auxiliaries down for repairs or other reasons, the transformer is capable of 70 percent of its full rating.

The five voltage taps in the 132-kv winding are available on a manually operated tap changer. Bushing type current transformers for each winding, Type TRC thermal protective relay, lighting arresters mounted directly on the units, and complete control equipment for auxiliaries, supplement the usual accessories associated with transformers.

These transformers are installed in a row on a concrete structure. Below them are the tunnels through which the gas-filled cables come from the generator. In a second row beside and parallel to these units are the four three-phase auxiliary transformers. All transformers are separated from each other by masonry fire walls and each has facilities for selectively smothering fire by carbon dioxide from a tank of 10 tons capacity. Steel structures for supporting the connections to the 132-kv and 66-kv yards are erected above the fire walls. The whole assembly is located immediately adjacent to the southwest corner of the plant.

Auto-Transformer Bank

An auto-transformer bank of three single-phase, forced-oil-cooled transformers (plus one spare) steps down from 132,000 volts to 66,000 volts. These are each rated 35,000 kva and have a 6,585-kva, 7,200-volt tertiary. The 132-kv winding, having 115-kv class insulation, has five tap voltages obtainable on a manual ratio adjuster. As in the case of the main transformer bank, modern practice has resulted in units of minium size and weight. Each unit weighs less than 95,000 lb, covers a floor area 100 in. by 140 in., is 168 in. high over the cover and has an over-all height of 208 in. when the bushings and arresters are assembled.

The tank of the transformer is of completely welded construction, there being no bolts or gaskets used even for the cover. An automatically regulated nitrogen gas seal protects the insulating oil.

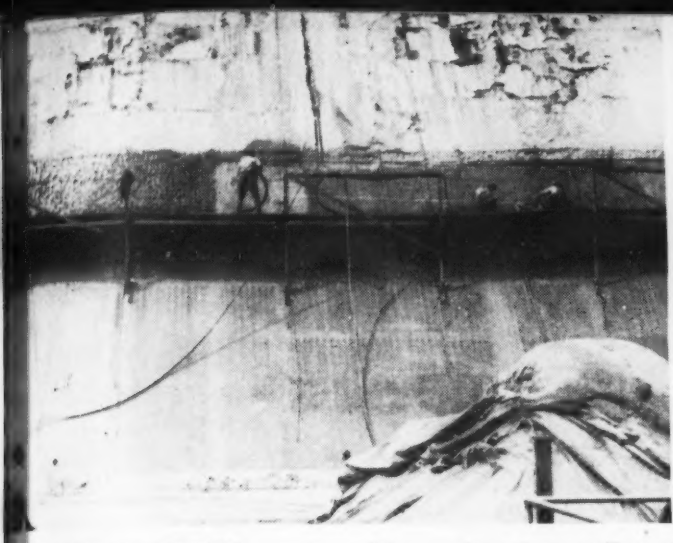
Each transformer has two complete forced-oil, forced-air-cooling units, each consisting of a 3-hp, motor-driven pump submersed in oil, and three ½-hp motor-driven fans. They are arranged so that one of these units starts when the oil circuit breaker is closed, energizing the bank, while the other comes on when the thermostat calls for it. The motors operate at 208 volts, three phase.

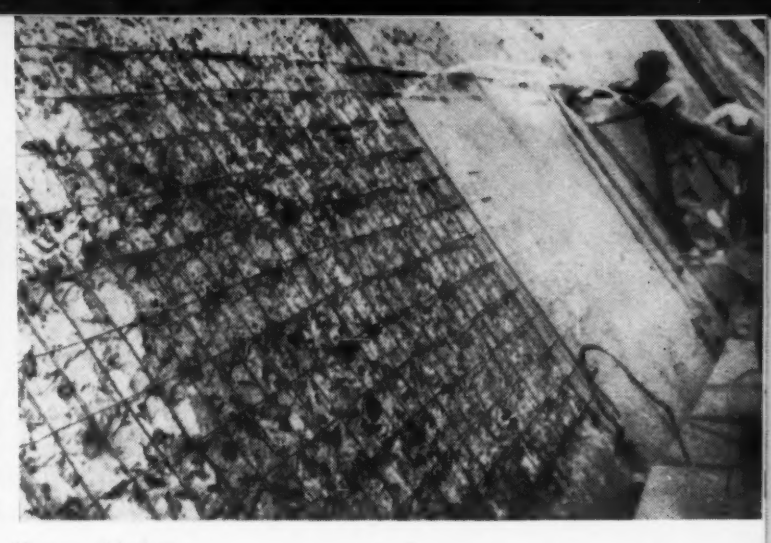
All windings have bushing-type current transformers for differential relay protection. The 132-kv and 66-kv windings are protected from impulses by 109-kv and 60-kv arresters, respectively, mounted directly on the transformers. Temperature detectors are available for checking the temperatures of the windings.

Minimum Material

Every effort was made to reduce to a minimum the amount of material used in the transformers of the main and auto-transformer banks No. 1 and 11. Three major factors to this end were the use of forced oil, forced air cooling; use of reduced insulation; and employment of high permeability steel in the cores. Besides contributing substantially to lower first cost of the equipment itself, important economies result from the ability to move the completely factory-assembled unit from its transporting freight car directly to its permanent foundation with necessity only for making external connections and mounting arresters to render it ready for service. The self-sufficiency of the unit, with its self-contained, automatically controlled auxiliaries and built-in auxiliary power sources, coupled with the inherent reliability of modern transformers, augurs a minimum of operating and maintenance expense throughout its life.

Features of the switchyards, auxiliaries and controls will be detailed in an ensuing issue.





CREW OF 18 MEN correct condition resulting from spalling of 23-year old dam

Gun Resurfaces Spall-Eroded Dam

Unsightly downstream face of Georgia Dam repaired by reinforcement and gunite operations on movable scaffold

SUBSTANTIAL ECONOMY in cost per square foot of resurfacing of Tugalo Dam, one of six hydroelectric dams in north Georgia, was accomplished by Georgia Power Co by use of a movable scaffold to facilitate guniting repairs. The 155-ft gravity concrete dam, near Tallulah Falls, is 850 ft long at the top, 300 ft long at river level, and about 115 ft thick at its base. Since its completion in 1923, no repairs to the dam have been made on its smooth face. However, spalling recently had spread over the downstream face of the dam.

Studies by the engineering and the operating departments showed that repairs and resurfacing could be more profitably done by the Gunite process, using a specially designed movable scaffold. The other method considered was to pour a slab on the surface of the dam. However, this method would necessitate a series of forms as well as scaffolding, along with a substantial amount of auxiliary and concrete-mixing equipment. The equipment for the guniting work consisted of one mounted, electrically-driven, 500-cfm air compressor to operate the four chipping hammers and the gunite gun; the gunite dry mixer, and a water system.

Scaffold Details

Frames for the movable scaffold were made of 2½- and 3-in. angle iron in the company's shop and assembled at the base of the dam. The sleds were supported by steel cables anchored at the top of the dam and held in place by anchor clamps. The cat walk sections were hinged every 18 ft so that any section or series of sections could be raised to a higher level by block and tackle while work was progressing at lower levels.

Wes Edmonds, assistant superintendent of north Georgia plants, assembled an 18-man crew for the job. The crew included four chippers; one gunite mixing machine operator, three to feed sand and cement into the mixing machine; four in the resurfacing crew; one gunite gun operator, one hand finisher, one to wash down the dam after chipping, and three laborers. He started the chippers a few days ahead of the other work to insure continuous progress.

Gunite on Reinforcement

The procedure was as follows: chipping was 1½ in. deep to sound concrete, with the surface left rough to insure a good bond. Over the chipped surface was laid a 6- by 6-in., No. 6 gage, 72-in. wire mesh which was held in place by ¼- by 4-in. expansion anchor bolts with a ¾-in. angle bend. The mesh was held 1¼ in. out from the chipped surface. The anchor bolts had a tapered lead collar which was expanded to hold the bolt tight in the concrete. Holes for the anchor bolts were drilled with air and star drills after the mesh was placed on the surface of the dam. They were spaced on 3-ft centers, with alternate rows staggered.

After the mesh was in place, the surface was washed down with water to remove all loose material and dust, then gunited with a 2½-in. coat which raised the original surface 1 in. Air pressure was 55 lb, and the water pressure to the nozzle was 60 lb. The surface was then finished smooth by trowel and wooden float, and cured for about eight days by running water from perforated pipes.

Sections Staggered

The dam was divided into sections to facilitate the work, which started at the base and covered a 6-ft vertical area. Since the crew averaged about a 40-ft section each working day, the chipping crew moved to the next higher level before the gunite crew had completed its level.

Cost and time records showed that the job was being accomplished substantially cheaper per square foot than was the case of a previous job which used a different type of scaffold and working procedure. Cost was approximately half of what it was on a job completed in 1941-42 when wages and material costs were much lower than at the present time. The movable scaffold was chiefly responsible for lower costs and greater work efficiency.

Supervisor and Employee

Intelligent planning and continuous operation are essentials to success of training program for supervisors

W. H. SENYARD
Director of Personnel
Louisiana Power & Light Co
New Orleans, La.*

IN WORKING for better employee relationships, we are attempting to make a sale. We are trying to sell an idea. Our supervisors and our employees are the prospects. Our company and our industry are our products. Training and information programs are the media through which we hope to make the sale.

In the field of merchandising, competitive products and concerns are always seeking the prospect's attention and dollar. In training, competitive ideas and doctrines are always seeking the employee's attention and acceptance. A sale is usually made. Either you make it, resulting in a better understanding and appreciation on the part of your employees of your company's and industry's problems with greater loyalty to their company and enthusiasm for their work, or a competitive ideology makes the sale, which tears down all that you are trying to build up.

But the job isn't done when the sale is made. In this type of selling you must keep your prospects continuously sold, for your competitor does not give up. You wouldn't let your market for electricity slip away from you. Nor would you tolerate a condition that daily made your customers think less of your company and its intentions. By the same token, let's not let our market for employee loyalty and enthusiasm to our companies and our industry slip away from us. The only way to keep our employees sold is to keep them informed. And the way to do that is through their immediate supervisors.

Our plans for a supervisory training program, as part of our employee training plan, were crystallized in the fall of 1941. A schedule of monthly meetings was established, arranged for certain locations that would make it possible for all of our supervisors to attend classes without too much traveling or inconvenience. This was necessary due to the nature of our operations. We are not a metropolitan company, but on the contrary operate in 571 communities, with facilities in 43 of the state's parishes. Top supervisors, including all of the department heads of the company, among whom were three vice-presidents, were trained as instructors to conduct these classes. The course was conducted on company time on a rigid schedule, and regular attendance was insisted upon.

Let me again emphasize a point here that is extremely important. A good plan is necessary. Without it little can be accomplished. But even with it little will be accomplished unless the top supervisors support it actively and wholeheartedly. That is a prerequisite to success.

Material Covered

In the beginning of our supervisory training we concentrated on human relationships with the objective of developing our supervisors as leaders, and to inculcate in them a keener understanding of human relationships to guide them in their associations with members of their individual groups. We used our own printed text entitled "Leadership in Business," which included lessons on "Relations Between Supervisor and Employee," "The Supervisor's Job," "Budgeting Time," "Selecting New Employees," "Training Old and New Employees," "Giving Orders," "Reprimanding," "Preventing Accidents," "Care of Materials and Equipment," "Encouraging Employee Suggestions," "Grievances," and "The Supervisor is a Super Salesman."

This lasted about four or five months. The reaction was good. Not only was our primary objective being accomplished, but we realized that these meetings were definitely a morale factor. Getting our supervisors together on such occasions resulted in a better feeling toward their company, their associates, and their jobs. The general office representatives who attended these meetings stayed in closer touch with the field supervisors and their problems. During the war, with the advent of manifold duties and responsibilities as well as travel restrictions, this afforded many general office representatives the only opportunity for maintaining personal contact with field supervisors. When the material in our training text was completed, it was felt that the meetings were doing too much good to be discontinued. Therefore, material from an outside source was used for approximately one year, with meetings continuing at monthly intervals. The subject matter of this material was along the same general lines as that in our own text, but presented in a different manner.

After using that material for one year, it was felt that we were ready to move into a strictly conference type of meeting, although there had been much free discussion during the previous two stages. This produced excellent results with a very favorable response.

During the latter part of 1944 it was decided that our supervisors were not getting the information they needed to be conversant with present day problems affecting their industry, their company, and their jobs. Because employees needed to know more about these problems, the supervisors would first have to be informed, so that they in turn could pass along the information to the members of their respective groups. In accordance with this thought, a series of lecture-conference meetings was scheduled on a number of important topics.

Meetings of this type are being continued at the present time. In advance of each meeting a program showing the date, time, location, name of discussion leader, subject, and all current data, is sent to each

* Abstract of paper to Southeastern Electric Exchange.

Training Is a Selling Job

supervisor. He is then in a position to come to class prepared with questions and ideas that may help him and others. At the conclusion of each class a written report is made by the class secretary on the attendance and subject matter covered.

This supervisory training program has been in effect five years, with meetings held at monthly intervals. A great number of subjects have been covered.

Introducing New Employees

One of the tangible results of the supervisor training program is the development of a valuable tool for standardizing one phase of the introduction of new employees. A scattered type of operation, such as ours, requires small groups in widely dispersed locations, making the need for standardization evident. It doesn't require great imagination to appreciate the wide differences in approach that may be applied by a group of perhaps a hundred and fifty supervisors, such as construction foremen, meter foremen, and district managers, in employing new people.

One supervisor might tell the new employee all he needed to know of his new job, another might tell him only his rate of pay and then put him to work, letting him shift for himself and to find out as best he could the details of the work he would be required to do. The suggestion was made in one of our supervisory meetings that this situation could be overcome with a check list to be used by supervisors when adding new employees to their groups. Accordingly, a card 6 by 9 in. was prepared, containing this introductory instruction to the supervisor:

"Give the employee ample time for asking questions or taking notes. Be sure that each of the points listed below is thoroughly understood. Give the new employee a copy of 'Know Your Job,' signed by you."

Topics on the check list which the supervisor is required to cover thoroughly with each new employee are listed on this page.

When the supervisor has covered all of the points on this check list, he gives to the new employee a companion form entitled "Know Your Job" containing the same items. The wording at the top of the form is changed to read:

"The following points about your company and your job have been discussed with you. If at any time you have any questions or problems about any of them, or if you have any suggestions or recommendations, please talk them over with me."

This is signed and dated by the supervisor and given to the employee to take home.

An employee's handbook entitled "Howdy, Partner" is sent to each new employee from the General Office of the company as soon as the payroll slip is processed. This is accompanied by a letter to the employee. It is believed that repetition in the handbook of those points covered by the supervisor add emphasis and strength to the program.

So that the new employee will know how he is getting along on his job, how he stands with his supervisor; and so that the supervisor and the company will know how he is thinking and can get the benefit of any suggestions or recommendations that he may have, progress reports are made at the end of three, six, and twelve months of service. These are not merit rating charts. They represent intervals at which a supervisor talks to an employee about his job, and discusses the progress he is making. If he is entitled to commendation, he is told so. If he needs constructive criticism, he is also told. This procedure is required of supervisors in the case of all new employees. At the present time we are seriously considering extending this plan to all employees, applied at semiannual intervals. The results of these interviews are recorded on a form provided for the purpose and sent to the general office personnel files, a copy remaining with the supervisor. It has been found that the employees appreciate knowing where they stand, and that such contacts, even when constructive criticism is necessary, bring the supervisor and the employee closer together. If he hasn't done so before, the employee is in a position during this interview to pass on suggestions, recommendations, gripes, or what have you, so that necessary action may be taken on them.

Friendship in Business

Though similar courses have been conducted in years gone by, we carried through an all-employee training program in 1945 entitled "Friendship in Business." This was conducted by the classroom method with meetings being held at weekly intervals. Prior to its inauguration, key supervisors were assembled in New Orleans for a training meeting and supplied with an instructor's manual which contained information on conducting classes, lesson outlines, class records, class report blanks, etc. Sandwiched in with the lessons devoted to employee-customer relations were others of a general information nature such as "Special Privileges and Fair Play," "Cooperatives," "Valley Authorities," "Private Enterprise," "Todays Problems," etc. The purpose of these extracurricular lessons was to raise the level of understanding on the part of our employees on those matters that concern them, their industry and company. Many of them had read occasional news releases about a number of these topics, quite often having a subtle intent contrary to private enterprise.

At the conclusion of the training program, "graduation exercises" were held for the various groups, consisting of employee suppers with attractive "diplomas" being presented to each one. It's surprising in what esteem these "diplomas" are held.

Supervisory and employee training is needed more today than ever before. More problems are facing all of us than at any time in the history of our country. To keep America sound, to keep American industry sound, the individual members of our business and industrial organizations must be acquainted with those problems and help in their solution.

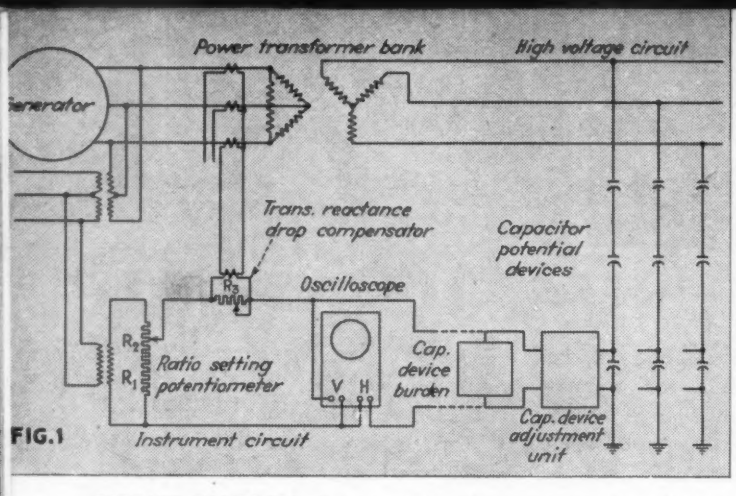


FIG. 1

CIRCUIT DIAGRAM of instrument and connections for adjusting capacitor potential devices

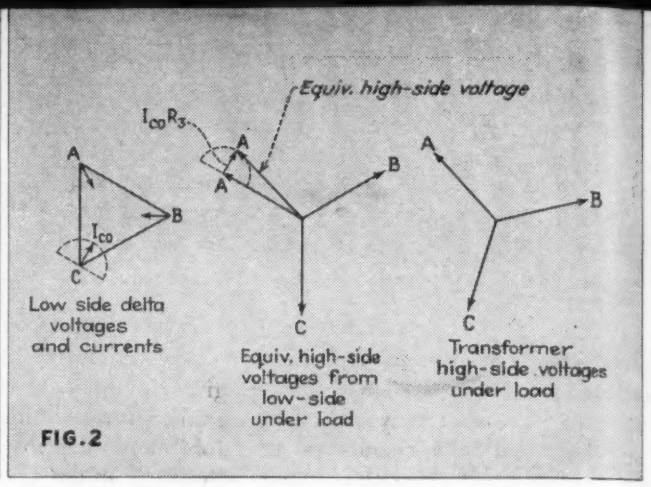


FIG. 2

VECTOR RELATIONS for adjusting capacitor potential devices through loaded power transformers

New Instrument Adjusts

FERBER R. SCHLEIF
U. S. Bureau of Reclamation,
Coulee Dam, Wash.

RAPID installation of many capacitor potential devices at Grand Coulee power plant during the war led to the development of a new instrument and technique for the adjusting of these high voltage devices. Capacitor potential devices have recently found wide amplication in the high-voltage field because they afford an inexpensive source of potential for switchboard indicating meters, relaying, and synchronizing. They also provide for coupling of carrier frequencies to the high-voltage circuits for communication, carrier pilot relaying, and telemetering. For accurate metering they require careful adjustment after all burdens have been connected. Their accuracy of adjustment is appreciably affected by any change in burden. Thus a readjustment is desirable after the addition or removal of any burden. This has been their chief disadvantage.

With the large number of capacitor devices at Grand Coulee, securing accurate adjustment under accelerated installation and heavy load conditions was difficult. The problem was further aggravated by the necessity for adding meters and relays gradually as they were received from the factory. They were added after the generating and transmission equipment had been placed in operation with minimum or temporary metering and relaying equipment.

Deenergized Test

High-voltage capacitor devices were usually adjusted by removing all load from one of the power transformers that serves the high-voltage bus connecting the devices. The transformer impedance drop then became negligible. The high-voltage could be determined from the transformer turn ratio applied to the low-voltage. This could be measured by the usual potential transformers connected to the low voltage generator bus. By trial and error adjustments, the capacitor device output voltage was brought to bear the desired relation to the low-voltage as indicated by voltmeters and wattmeters or phase-angle meters. Although this procedure had become more or less standard, it possessed disadvantages. The portable test instruments used introduced some error due to their own temporary burden. The adjustment for ratio and phase-angle on the device was made by trial and error. Also, it required the interruption of power.

New Instrument

The scheme finally developed, and described here, permits direct and instantaneous observation of the accuracy of adjustment as each change in adjustments is made. These indications and adjustments are independent of the capacitor devices on the other phases. No burden at all is placed on the capacitor device by the instrument. The adjustments can be made at any time regardless of load conditions on the circuits involved. This is accomplished by setting up a reference voltage of the correct magnitude and phase angle and balancing this voltage against the output voltage of the capacitor device. The difference voltage is measured by one sweep of a conventional cathode-ray oscilloscope tube. The other sweep of the oscilloscope is operated by the reference voltage itself. The fundamental circuit for the instrument is shown in Fig. 1. This circuit produces a pattern on the oscilloscope screen in which ratio error and phase angle error in the adjustment of the capacitor device are separately distinguishable.

Drop Compensation

The reference voltage, against which the output voltage of the capacitor device is balanced, is obtained from the potential transformers. These are customarily connected to the low-voltage side of the power transformers. The desired magnitude of the reference voltage is obtained by a resistance voltage divider. This voltage is then corrected for the transformer reactance drop by a transformer drop compensator circuit.

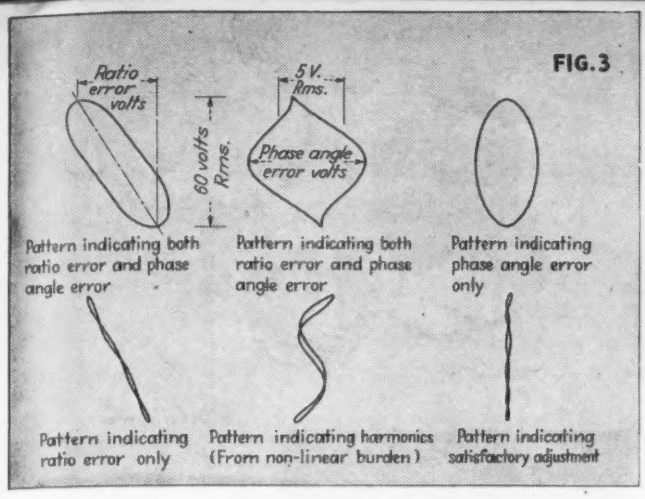
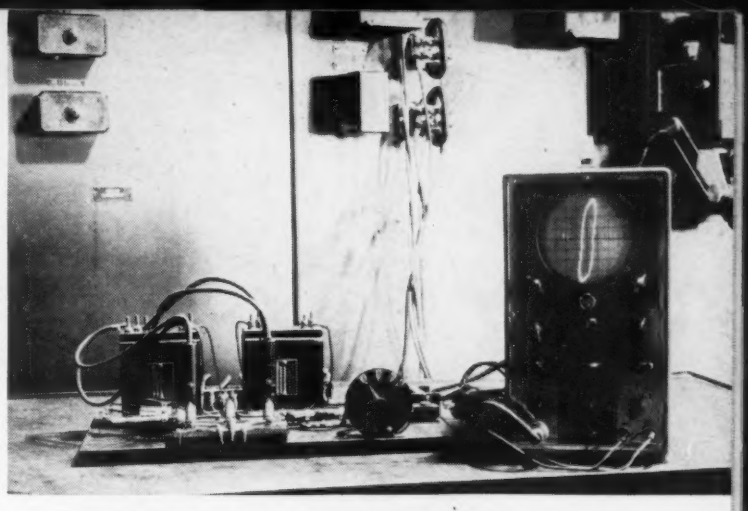


FIG. 3
Ratio error volts
60 volts Rms.
5 V. Rms.
Phase angle error volts
Pattern indicating both ratio error and phase angle error
Pattern indicating both ratio error and phase angle error
Pattern indicating phase angle error only
Pattern indicating ratio error only
Pattern indicating harmonics (From non-linear burden)
Pattern indicating satisfactory adjustment

OSCILLOSCOPE PATTERNS produced in adjusting capacitor devices for phase-angle and ratio error



INSTRUMENT IN USE in Grand Coulee power plant. Connections are plugged into terminal boards in rear

Capacitor Potential Devices

Voltage vector relations for transformer drop compensation are shown by Fig. 2. Balanced primary voltages and currents are assumed, and the transformer resistance is neglected. This transformer drop compensator in the circuit permits the adjustments to be made independently of the load through the power transformer bank. It is only necessary that the impedance or reactance of the transformer be known, and the compensator adjusted accordingly. Balancing the capacitor device output voltage against the reference voltage so that only the difference voltage is measured constitutes a null balance process. Here, no current is drawn from the capacitor device circuit by the instrument when correct adjustment is reached. Thus the test instrument burden problem is eliminated.

Operating one sweep of the oscilloscope from the reference voltage while the other sweep is operated by the difference voltage, produces a diagonal ellipse on the screen if both ratio and phase-angle error are present. This is shown by the photograph. If only ratio error is present, the figure produced is a diagonal straight line. If only phase angle error is present, the figure is a vertical ellipse. Correct adjustment is indicated by a vertical straight line. Thus, the operator can virtually see what he is doing, and no laborious calculations or plottings are necessary. Typical patterns and their interpretation are shown in Fig. 3.

Construction

Construction of the instrument is simple. Suitable potential and current transformers may be found with little difficulty. Those in the instrument shown were wound on the cores of obsolete auxiliary instrument transformers. The potential transformer within the instrument has a ratio of one-to-one. Its purpose is to avoid the ground ordinarily on one side of the conventional open-delta metering potential transformer secondaries.

The internal current transformer also avoids the ground on the metering current transformer circuits, and its ratio may be rather high (5 amp-to-0.1 amp). This reduces the burden imposed by its resistor upon the metering current transformers. However a lower ratio can be used satisfactorily. A double primary on the current transformer is convenient for obtaining the equivalent third phase current when metering current transformers are available on only two phases.

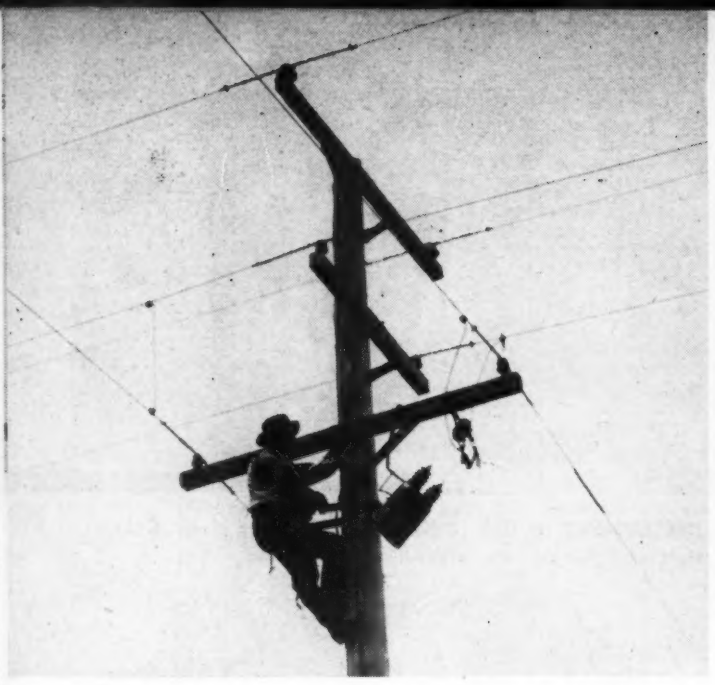
The scheme is adaptable to use with three-winding power transformer banks by incorporating a second transformer-drop compensator in the circuit. The resistors are small slide-wire units and are set by measurement with a bridge or other means to the required values as indicated by the following formulas. The symbols in these formulas refer to the circuit diagram that is shown in Fig. 1.

$$R_3 = \frac{\text{Transformer \% Impedance} \times \text{Rated Transformer High-Side Volts-to-Neutral} \times \text{C.T. Ratios}}{\text{Required Potential Device Ratio} \times \text{Rated Transformer Low-Side Line Current}}$$

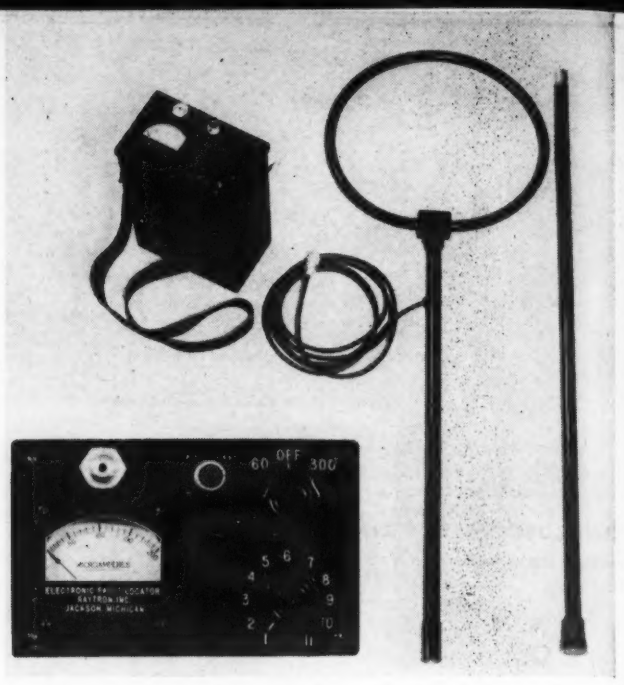
$$\frac{R_1}{R_1 + R_2} = \frac{\text{Rated Transformer High-Side Volts-to-Neutral} \times \text{P.T. Ratios}}{\text{Required Potential Device Ratio} \times \text{Transformer Rated Low-Side Volts}}$$

Tandem selector switches for the potential circuits and current jacks and plugs provide for convenient switching from one phase to another.

This instrument scheme provides an automatic check on wave form of the capacitor device output. Any harmonics introduced appear as distortions of the oscilloscope pattern. The capacitor devices, having both capacitance and inductance in their network, are easily disturbed by harmonic frequencies if they are introduced in any appreciable degree. Any non-linear burdens, such as instruments or transformers producing appreciable saturation of the iron in their magnetic circuits, must be avoided. In one case, enough harmonics were found to produce one of the patterns shown in Fig. 3. A step by step elimination of the various elements of burden on the circuit, located the instruments introducing the harmonics. After their removal, a normal reliable adjustment was easily obtained.



TEST CAPACITOR installed with temporary hanger and fused connection, is suitable for voltage of the circuit



GROUND DETECTOR and loop with inset of detector control and indicating meter

Mobile Detector Locates Faults

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and
HENRY HAAS
Consumers Power Co
Jackson, Mich.

THERE IS a tendency to assume that location of faults on open-wire power distribution circuits by detection methods is complicated and too technical as compared to time-honored "cut and try" methods. However, a time-saving technique and equipment has been developed which makes location of faults on either ungrounded overhead primaries or secondaries, or the common multi-grounded system, easier, faster and safer. Basically, the procedure operates by detecting the 300-cycle component of the current which flows to any accidental ground. A standard capacitor is used to increase this 300-cycle component (fifth harmonic on 60-cycle system) so that its path along overhead conductors to the point of fault can be clearly traced by a detector located on the ground below the conductors. This detector consists of a search coil and amplifier feeding into a micro-ammeter indicator. Adaptability to the various overhead distribution circuits is achieved (1) by selecting a capacitor suitable for the voltage of the circuit and (2) in the manner of connecting the capacitor into the circuit.

The method is safe. The only apparatus connected to energized conductors are standard production capacitors. Connection can be made to de-energized conductors, and the test capacitor energized by switch stick or safety switch. Following the circuit to locate the fault may be done with all personnel and equipment at safe distances from energized conductors.

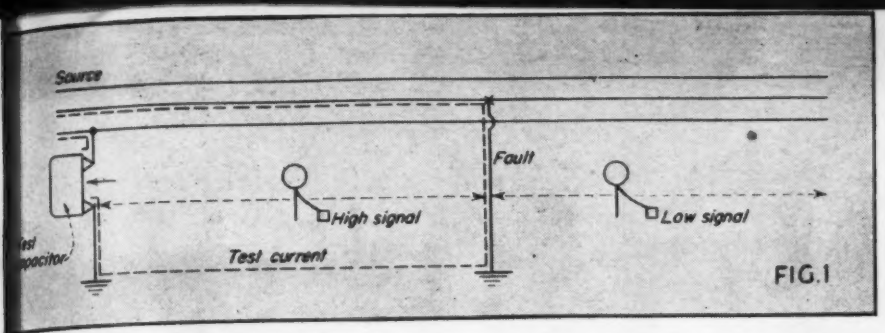
Ungrounded Circuits

For all normally ungrounded circuits, primary or secondary, the detector is first located directly under the lines to be tested, preferably at one location under each circuit leading away from the substation, or power supply transformers. With a fixed sensitivity setting of the detector, a record is made of the reading of the detector meter at each test location. Then a 15-kva capacitor, of the same voltage rating as the circuit to be tested, is installed, preferably at the substation, and energized through a suitable fuse between one *clear* phase and ground. A second detector reading at each previously recorded test location will show an increased indication on the detector meter along the circuit route leading to the fault. Following this circuit the detector indication decreases sharply after the accidental ground is passed.

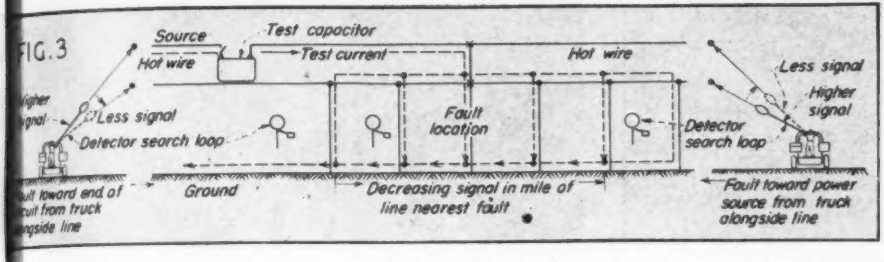
Fig. 1 illustrates the use of the detector on ungrounded circuits. Sometimes, particularly on low voltage power secondaries, stray fields due to lighting secondary currents returning through ground cause such high readings that the capacitor test signal is difficult to distinguish. When this happens, switching the capacitor on and off slowly, by manual or automatic means, will cause the test signal indication to stand out clearly on the detector meter. All of these operations can be carried out without deenergizing the circuit to be tested, or causing inconvenience to any other customer than the one where the actual fault is located.

Multi-Grounded Neutral Circuits

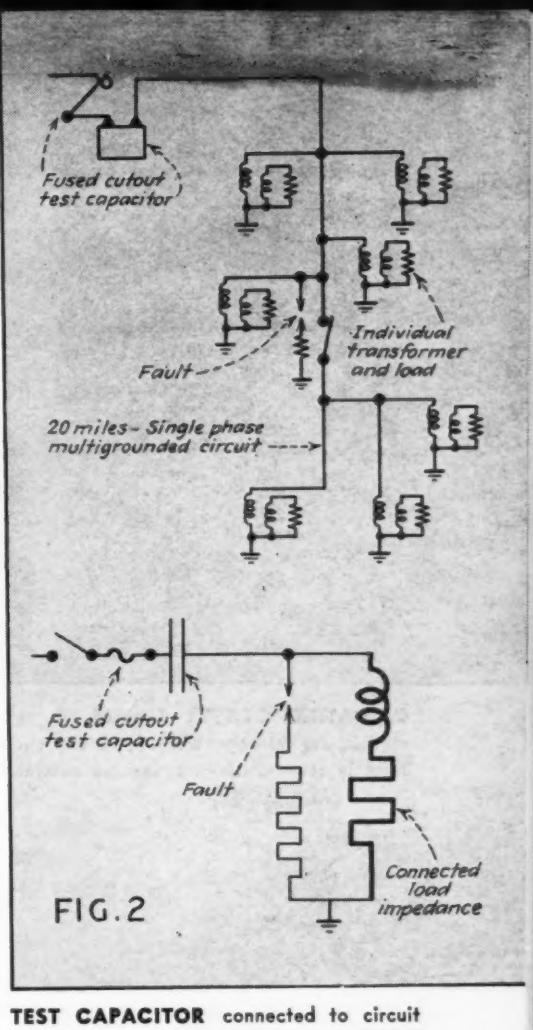
There are two essentials to locating shorts on multi-grounded lines. Enough voltage must be available to break down partially damaged gaps in valve type arresters, or healed insulation breaks. There must be a current limiting device to limit signal current through the fault to a few amperes. A single-phase, 15-kva capacitor of a rated voltage equal to that of the distribution line on which it will be used has been found to be



LOCATING GROUND on normally ungrounded circuit, with a 15-kva test capacitor to increase signal current



FAULTS on a multi-grounded neutral circuit may be located to the particular pole, and to the vertical level on the pole of the conductor in trouble



TEST CAPACITOR connected to circuit with fault paralleling the connected load impedance. Sectionalizing of very long lines may be necessary to establish signal current

On Overhead Lines

satisfactory for this purpose. The faulted line is disconnected from its open supply switch and the capacitor "cut in," one terminal to the "dead" side of the supply switch, the other to the faulty line section.

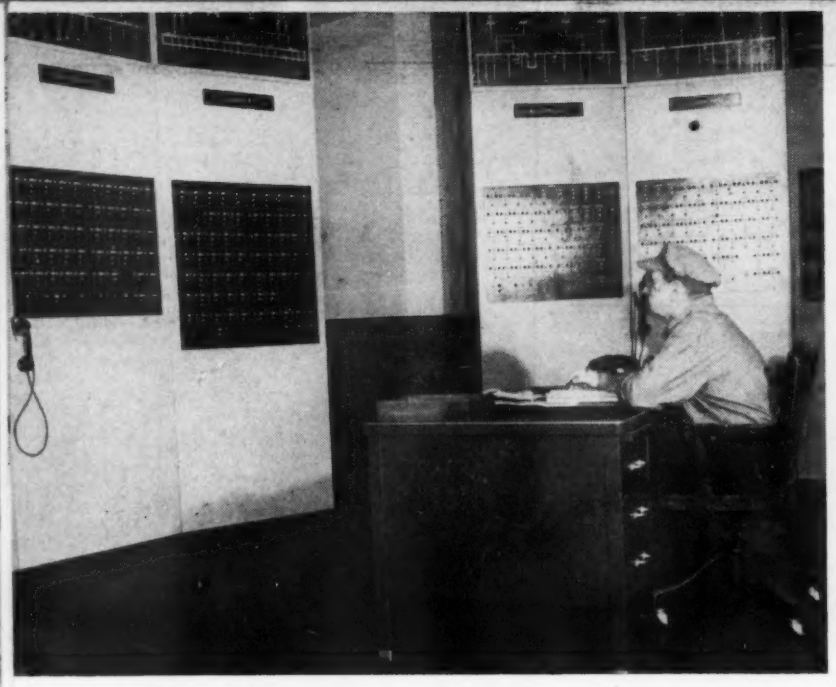
After the capacitor is installed and the sectionalizing fuse fitted with the proper size fuse link and closed, the signal current must be definitely established. When signal current flows across the fault a voltage test at a customer's meter on the faulted line section will show either nearly zero, indicating a solid short, or a varying voltage, indicating an arcing fault. However, if the voltmeter reads a steady value of 5 volts or more, then signal current is not flowing. Failure to establish signal current occurs when voltage between "hot" wire and ground wire on the load side of the test capcitor is too low to start current flowing through a faulty lightning arrester, or other damaged equipment.

On a multi-grounded distribution circuit a fault is always parallel with the active load of the circuit in trouble as shown in Fig. 2. When load impedance is low compared to the test capacitor impedance, voltage across the load impedance may be too low to break down the fault gap and it may be necessary to disconnect end sections of the faulted line in approximately 5-mile pieces until either fault current is established or until the fuse at the capacitor blows. A 15-kva capacitor will energize up to 15 miles of line and connected distribution transformers, to a voltage sufficient to break down faults and establish a signal current.

When signal current is established, the line is ready for fault location with the ground detector. Following the signal along the circuit, the particular pole on which the faulty equipment is located can be quickly determined. Between test capacitor and the fault, the "hot" wire of the circuit will carry more current than the ground wire. Pointing the loop alternately at either conductor will show the difference clearly. Beyond the fault, the "hot" wire carries little current. When the line conductors are spaced vertically, the same test can be made by an observer standing on the bed of a trouble truck located approximately 20 ft to one side of the line. Fig. 3 illustrates this operation. The higher the platform on which the operator stands, the more clearly can the fault be distinguished.

When located, the fault may be cut free immediately without deenergizing the test capacitor, provided precautions for "hot" line work are observed. Should resonance occur between test capacito and distribution transformers after the fault has been cleared, a correctly sized fuse energizing the test capacitor blows in a few seconds, removing any hazard to customer's equipment. Quite often a damaged lightning arrester causing a line short will be destroyed by the signal current in a few minutes, even before locating it with the detector. If this happens, resonance may occur, the sectionalizing fuse blows and all signals disappear. These events automatically indicate that the line is clear and ready to be energized normally.

"In service" experience in using this detector has impressed on its users the importance of following through each step of the test procedure. When this is done, the detector has proven a valuable aid in locating and clearing accidental faults with far less time and effort than by previous methods. The first detectors were built in 1939, and about 20 sets of equipment are now in use in the various districts of the Consumers Power Co.



OPERATING CENTER First of the supervisory-control centers, with semicircular arrangement of panels, allows observation of all operations in seven initially connected substations

DIRECT CONNECTION Control center operator may communicate directly from any control panel to the substation it controls

Four Remote Control Centers

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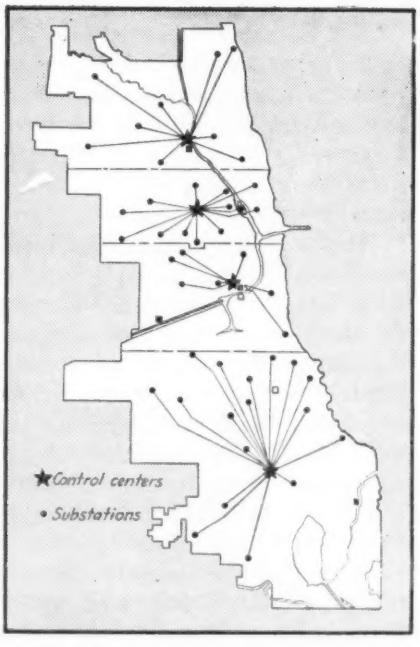
Chief Staff Engineer
Commonwealth Edison Co
Chicago, Ill.

EXCEPT for the omission of indicating instruments, operators at four control centers on this Chicago system will have before them an extension of the controls for 46 system substations when the company's new supervisory control system is completed. Now being installed in progressive steps, the control system divides the city into four areas. From a control center in each area all operating, field inspection and trouble dispatching operators for the area will be coordinated.

Completion of this system will place nearly all of the a-c substations and rectifier substations under supervisory control. The adoption of the plan is based on 25 years of successful operation of remote control substations during which 29 substations were operated unattended.

The old method of remote control was a pioneering development under which a substation was operated from a nearby attended substation by a synchronized dial switch. Controls for the 29 substations were spread among 17 attended substations. Trouble dispatching and field inspection were directed from other headquarters. Under the new set-up there will be centralized supervision of all these functions at the four control centers.

The dial switch control was slow and required rotation of the switch through all positions to check conditions on any piece of equipment. In case of automatic operation the control point received an alarm, but operation of the dial was necessary for a complete check on the cause of the alarm.



CONTROL CENTER LOCATIONS Map of Chicago shows the city divided into four areas for remote control of all substations and for supervision of operations

Scope of Coordinated Plan

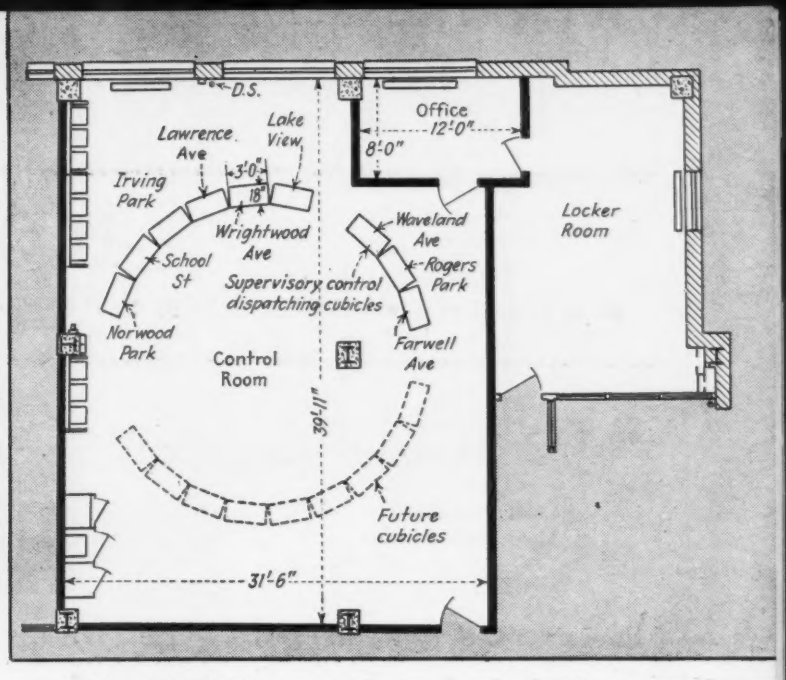
Type	No.	Kva Capacity
Supervisory-control substations	46	800,000
Industrial substations	285	800,000
Network vaults	280	250,000

Constant Supervision Provided

The new system gives constant supervision, since the control center has a complete panel with indicating lights for all equipment being controlled. Each operation can be checked before and after it is made and even during the separate steps of an individual operation. An automatic operation not only gives a trouble alarm but an immediate indication of what has occurred to cause the alarm.

Use of the old remote control system was limited to the smaller substations with simplified bus arrangements. The supervisory control system has a wider range of application permitting its use on more complicated substations. Also, the added safety obtained from constant super-

TRAVELING OPERATOR may communicate over the control circuit between the control center and the controlled substation without interruption of the control circuit



SEMICIRCULAR PLAN permits full view of each substation control cubicle from the central desk location. Office and locker room facilities are provided for the area's traveling operators

Supervise 46 Substations

Provides centralized supervisory control over operation of 46 substations totalling 800,000 kva . . . Coordinates dispatching and field inspection with remote operation

vision makes it acceptable for safe operation of 12-kv lines and larger blocks of capacity.

Centralized Control

Centralization of control takes the responsibility away from scattered operators of attended substations and concentrates it in the hands of control operators at four control centers. The supervisor at the control center is also the supervisor of the operators who handle manual operation of controlled substations during emergencies and the men who do inspection and maintenance work. Provision has been made for direct telephone service over the control circuit between the control center and the controlled substation without interruption of the control circuit. Thus all normal and emergency operation for the substation as well as routine inspection and maintenance will be the responsibility of the same supervisor and controlled or directed over the same circuit.

Each control center will receive and disseminate all information for the district. Indications of conditions in supervised substations will be constantly observed and the necessary operation performed. A log is kept of the men in the field so that they can be immediately dispatched to the scene of trouble or special assignments. In addition to the substations in a district operated by supervisory control, calls will be received from industrial customers in the same area. The operation and maintenance of the network vaults will be centered in one of the control areas.

Equipment Described

The main control room of one of the control centers, shown in an accompanying illustration, is about 31 ft by 40 ft and allows space for future expansion. The supervisor's office is so located as to have direct access to the control room and also to the headquarters for the inspectors and maintenance men for the area. The terminal equipment will be supplied by three different manufacturers, but general appearance will be similar to that illustrated.

Operation of control equipment for each substation is over a single pair of wires. Operaton of any button at the control end sends a coded signal to the receiving end. The received signal affects only those relays for which it is coded and causes the required operation to be performed. The procedure can be likened to the dial telephone except that it is necessary only to press a single button and the properly coded signal is set up automatically without dialing.

The control cable between the substation and the supervisory center is of the multi-conductor, twisted-pair type and also carries circuits for automatic load control, telemetering, and other utility services. All of the control circuits are relatively short and direct from the control center to the substation.

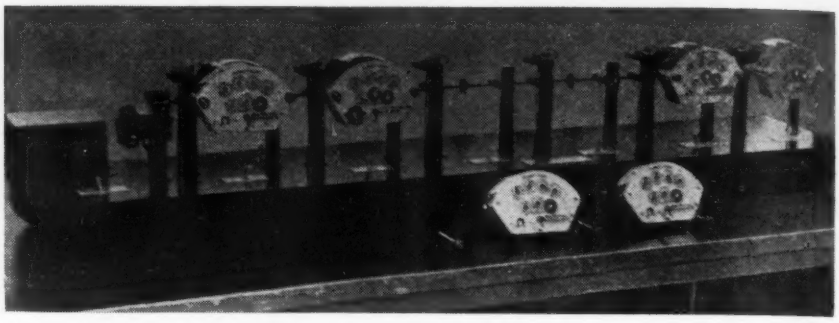
The changeover to supervisory control has been completed in the northern area and part of the substations are now connected to the Humboldt control. The entire program may take several years to complete, since present plans include the control for additional new substations as they are built.

HOW

DESIGN • CONSTRUCT • OPERATE • MAINTAIN

Demand Registers Tested At Constant Speed

M. D. JESTER
Meter Shop Foreman
Central Power & Light Co
Corpus Christi, Texas



SIX DEMAND REGISTERS may be checked on this drive shaft powered by a constant speed motor. Quick-contactors are used for connections to the register motors

CONSTANT SPEED is furnished to drive a group of cumulative or indicating demand registers for testing in the meter shop of Central Power & Light Co. This arrangement has been found more satisfactory than the phantom load test method because the exact registration may be predetermined and the synchronous speed drive is not subject to variations during the time of test.

Worm wheels of the registers are engaged by 100-tooth gear wheels on the shaft of the mounting rack. Shaft speed is set for 10 or for 20 revolutions per hour corresponding to 100 or 200 percent load on meters with constant of 0.6. Other constants could be provided with changes in the shaft drive gear ratio.

Since there is no change in the speed of the common drive shaft during the time interval of the test, the demand indicated by the register should equal the predetermined value as indicated by the disk constant and the shaft multiplier.

Each register position has a double-pole, double-throw toggle switch to apply either 120 or 240 v to the demand register motor. This supply is through a small auto-transformer from the 120-v source.

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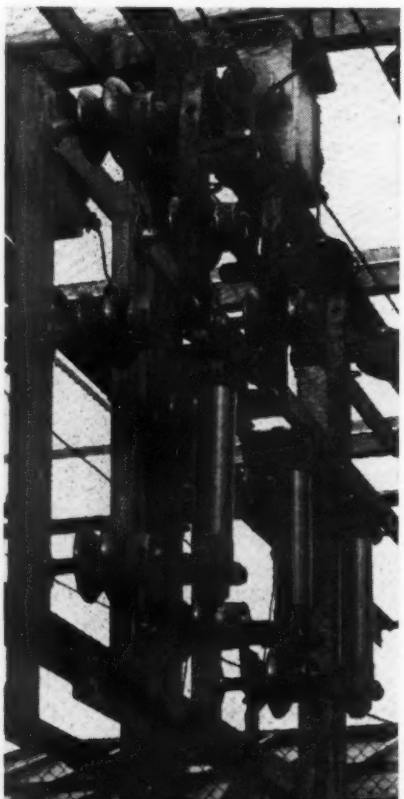
Fuses Protect 13.2-Kv Industrial Service

HOWARD W. GRATE
Distribution Engineer
Cincinnati Gas & Electric Co



CLOSE-UP VIEW of dry-type fuses and load interrupter disconnects

SIX YEARS of operation, with a connected load of more than 18,000 kva (war peak, 14,000 kw) at 13,200 v, has proven the practicability of protecting a large industrial plant service entirely by means of fuses.

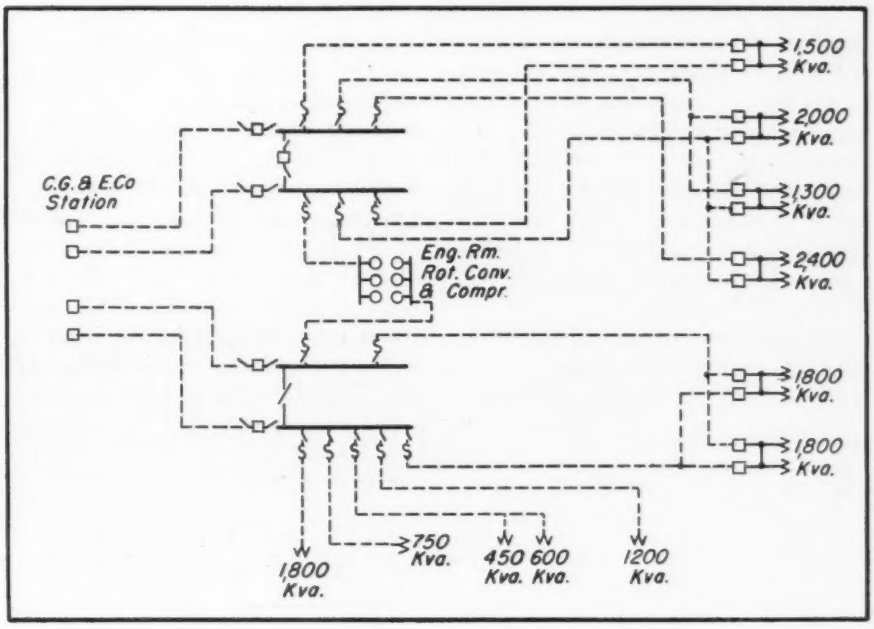
With 13 cables to transformer installations for the group of buildings, there were only three fuse operations during the six years. The resulting outage periods were somewhat longer than might have occurred with automatic oil switches, but the difference is not considered sufficient to have justified the much greater investment and expense. The customer considers this record of operation excellent.

Relatively small load sections were considered essential in the layout. There are two switching centers, each of which is served by two circuits from the utility substation. Six of the principal plant transformer installations are connected to two circuits from the switching centers, with non-automatic throwover oil switches at the transformer buses. Maximum length of the cable runs is 1,600 ft, but most of them fall under 1,000 ft in length.

This complete layout was made to replace the former automatic oil switch protection, which was made inadequate by the increase in capacity with load growth in the substation area. Fault currents possible were several times the switch interrupting ratings during several years of operation before the 1941 changes.

This arrangement and operating record is unusual because of the size

of load served, but the general application and success with fuses for industrial plant service at 13.2 kv. is typical on our system. Fuses are considered more reliable over a long period when there would ordinarily be no operations of relaying and switches. Westinghouse deion disconnecting type fuses and S&C dry type fuses with load interrupter disconnects are used in this installation.



DUAL CABLE SERVICE is furnished to the principal plant installations in this radial feeder layout. Throwover switches are nonautomatic. Two bus sections are carried in each of the two outdoor switching centers. Radial feeders extend from the fuses to individual plant transformer installations

• • •

Properties of Forticel In Mold and Film Forms

E. K. CLIVER
Product Application Dept†
Celanese Plastics Corp
New York, N. Y.

A THERMOSETTING MATERIAL known as Forticel has been developed by the Celanese Plastic Corp., New York. It is a plasticized cellulose propionate, made from the reaction of propionic acid anhydride with cellulose in the presence of a catalyst. This newest cellulose ester offers a combination of moisture resistance, form retention, rigidity and impact strength while maintaining good electrical properties as shown in the accompanying tables.

Present applications in the electrical industry are telephone housings and vacuum cleaner parts. It is being produced in the form of molding powder only, but sheets and films will follow.

TABLE I—Range of Properties of Forticel Molding Compounds

Property	Min.	Max.
Specific Gravity, 20 C./20 C	1.16	1.22
Tensile Strength, psi	2,300	6,000
Flexural Strength, psi	3,500	10,000
Impact Strength (Izod), ft lb per in. of milled notch 25 C (77 F)	0.6	11.4
Water Adsorption (24-hr immersion), %	1.2	1.7
Rockwell Hardness, R. Scale	R23	R104
Distortion under heat, deg C	49	66
deg F	120	151
Thermal coefficient of expansion, linear inch per inch per degree C $\times 10^5$	14.3	15.9
Flammability	slow burning	.....
Volume Resistivity, ohm—cm	10^{13}	10^{15}
Dielectric Strength, Ford 125 1-in. thick samples, volts/mil	385	430
Dielectric Constant, 10^6 cps	3.3	3.5
Power Factor, 10^6 cps	0.019	0.032

TABLE II—Effect of Humidity on the Electrical Properties of Forticel Film 3 to 10 Mils Thick

Property	
Dielectric Strength	
Volts per mil, 50% RH	1700 min. 2400 max.
Volts per mil, 95% RH	1700 min. 2400 max.
Volume Resistivity	
Ohm-cm, 50% RH	10^{15}
Ohm-cm, 95% RH	10^{14}
After 24 hr in water	10^{14}
Dielectric Constant	
At 10^6 cps, 50% RH	3.0
At 10^6 cps, 95% RH	3.4
After 24 hr in water	3.4
Power Factor	
At 10^6 cps, 50% RH	0.017
At 10^6 cps, 95% RH	0.020
After 24 hr in water	0.020

† Employment when article was prepared; author is now on electrical engineering staff of Burns and Roe, Inc, New York.

• • •

Use of Damper Windings on A-C Generators

I*—FACTORS

WILLIAM L. RINGLAND
Electrical Engineer
Allis-Chalmers Mfg. Co
Milwaukee, Wis.

KNOWLEDGE made available largely within the past 15 years concerning the functions of a generator damper winding appears to be rather slow in influencing purchasers' specifications. Past practice has been to require damper windings on practically all diesel-engine-driven generators and on only a minority of waterwheel generators. However, this practice does not generally reflect present operating requirements.

Since a damper winding increases the cost to the purchaser of a generator by about 2 to 5 percent, a careful analysis of its effects on performance seems justified for any new installation. Unfortunately, the obvious effects are not always important, while major benefits are frequently not recognized.

In view of the possible benefits of

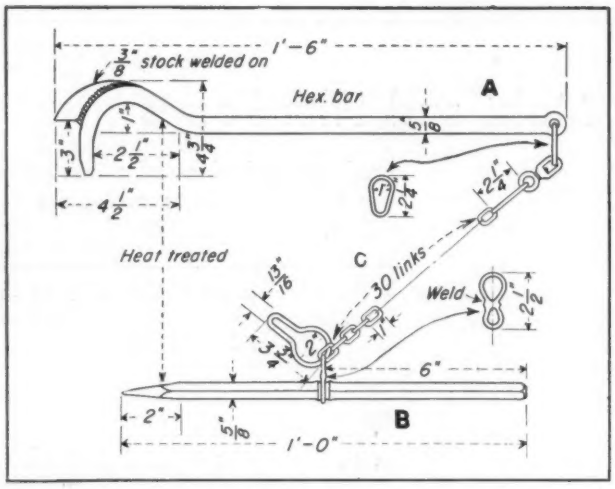
* Beginning a series of eight articles, adapted from a paper "Damper Windings for Waterwheel and Diesel Engine Driven Generators" presented at a Midwest Power Conference, Chicago.

a damper winding, the conclusion might easily be reached that all generators should have damper windings. Certainly the operation of a high-voltage waterwheel-generator connected to its system through several long capacitive transmission lines and subject to surges, short-circuits and loss of synchronism is likely to be sufficiently improved by a damper winding to justify its cost. The important factors are the reduction in overvoltages and the increased ability to continue operation through disturbances. On the other hand, low-voltage generators, either waterwheel or diesel-engine-driven, in an isolated station and supplying a local load probably would be benefitted only slightly, and the advantages probably would be outweighed by the cost of the damper winding and the effects of the great short-circuit currents. Between these extremes are the majority of installations, where the particular circumstances for the individual unit require a consideration of many factors, none of which may be of critical importance by itself.

Most of the effects of a damper winding on generator performance can readily be predetermined if operating conditions are known. The evaluation of this performance in terms of dollars return on the investment is probably a more difficult problem, but it must be done in some manner every time a new generator is purchased.

Some effects of a damper winding will be reviewed in more detail in subsequent articles.

Manhole Cover Lifter



MANHOLE COVER LIFTER folds into narrow space when not in use and is light enough to be carried in one hand

A SIMPLE but highly effective device for safely lifting manhole covers has recently been developed by the Boston Consolidated Gas Co and is also in use on electric utility distribution circuits in eastern Massachusetts. It consists of three sections: "A," a hexagonal iron bar 18 in. long over-all and $\frac{5}{8}$ in. in diameter, with a curved hook and welded heel piece at one end; "B," a handle bar 12 in. long and $\frac{5}{8}$ in. in diameter, with a welded eye piece in the center; and "C," a chain section of 30 links, each 1 in. long, with suitable connections by which the bar sections are tied together. In using the device, the hook of section "A" is inserted at the manhole cover to pry it slightly upward, and the cover is then lifted by pulling the chain taut with the handle "B" grasped firmly on each side of the center attachment point. The handle bar "B" is tapered for 2 in. at one end to facilitate further prying if necessary.

Series Capacitors Aid Load Center Regulation

SERIES CAPACITORS have been found useful in improving voltage regulation by neutralizing system reactance in supply lines serving many industrial welders in individual plants. Breaker interrupting duty is not increased because the capacitors are not removed from the circuit in case of a fault.

At the recent meeting of the Northeastern District AIEE in Worcester, Mass, W. C. Bloomquist and R. C. Wilson (GE) cited an installation of this type in which voltage regulation can be held within about 2 percent. Energy purchased from a utility at 33 kv is stepped down to the main bus for distribution at 11.5 kv to 2,500-kva load center units serving resistance welders. The existing diversity factor of 2 to 1 permits each load center unit to supply a 5,000-kva connected welder load. These capacitors will serve to cancel out the reactance between the 11.5-kv bus and the welders. Impedances are: Load center transformers, 6 percent; other components of the welder supply circuits, 1.25 percent, indicating the need for 7.25 percent impedance value in the capacitor set-up. These capacitors have been designed for a continuous rating of 125 amp, or 2,500 kva at 11.5 kv. They have been specified oversize to prevent operation of the capacitor arc gap during high load surges.

To insure improved line voltage regulation in this case, two 335-amp series capacitors will be installed, one in series with each step-down transformer between the transformer and the 11.5-kv bus. If a third transformer goes in, another capacitor will be added. Without series capacitors the voltage drop would approximate 20 percent at peak loads. Fault currents will be limited by reactors of 0.75 percent ahead of the capacitor protective equipment used to improve voltage regulation.

THIS 'SHORT' STOP IN YOUR PLANT?

IT DEPENDS ON THE "IC" OF YOUR PROTECTIVE DEVICES

If your transformer capacity has outgrown your low-voltage protective devices, bad shorts may not stop until they have traveled to the power company's breaker. This means production facilities shut down all along the line—all caused by a fault that could have been confined to one branch circuit. Where a short is stopped in your plant depends on the "IC" of your low-voltage protective devices. Make sure of your "IC." Here's how . . .

KNOW THE "IC" OF YOUR LOW-VOLTAGE PROTECTIVE DEVICES

The "IC" (interrupting capacity) of a circuit breaker or other interrupting device is the maximum current it is rated to *adequately* interrupt. It is essential that you know the "IC" rating of the protective devices on your low-voltage circuits.

BE SURE THE "IC" IS ADEQUATE TO INTERRUPT MAXIMUM SHORT-CIRCUIT CURRENTS

Maximum short-circuit current is *not* determined by the normal load on the circuit. The total capacity of the transformers feeding the circuit is the critical factor. In the table below, check your transformer capacity against the "IC" corresponding to your circuit voltage. The "IC" of your protective devices should be equal to or greater than the short-circuit currents available as determined by your transformer capacity.

IF YOU NEED MORE "IC," INSTALL G-E AIR CIRCUIT BREAKERS

It's easy to select the proper G-E air circuit breaker from the table. And you can be sure they have adequate "IC" to safeguard your production, equipment, and personnel. By providing three-phase interruption of dangerous overcurrents, G-E breakers eliminate the possibility of single-phasing damage to motors. Workmen can operate these breakers easily. A turn of the handle and power is restored—no parts to be replaced.

WRITE FOR THESE BULLETINS ON G-E AIR CIRCUIT BREAKERS

Write for the bulletins listed below, or contact your G-E sales representative. Apparatus Department, General Electric Company, Schenectady 5, N. Y.

GEA-3600 AE-1 Air Circuit Breakers

GEA-3642 AL-2 Air Circuit Breakers

GET-1113 Selection and Application of Air Circuit Breakers

GET-1233 Short Circuit Currents in Industrials

GEA-2596 Low-voltage Metal-enclosed Drawout Breaker Equipment

GEA-3592 Load-center Unit Substations

INTERRUPTING RATINGS—G-E AIR CIRCUIT BREAKERS TO USE

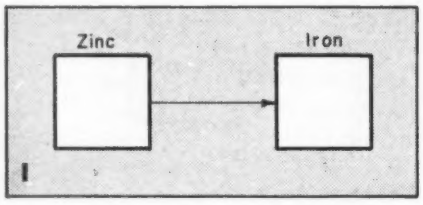
Transformer Capacity in Three-phase Kva	220-240 CIRCUIT VOLTAGE				440-480 CIRCUIT VOLTAGE				550-600 CIRCUIT VOLTAGE			
	Main Breaker		Branch-feeder Breaker†		Main Breaker		Branch-feeder Breaker†		Main Breaker		Branch-feeder Breaker†	
	"IC"	Breaker to Use	"IC"	Breaker to Use	"IC"	Breaker to Use	"IC"	Breaker to Use	"IC"	Breaker to Use	"IC"	Breaker to Use
300	50,000	AL-2-50	25,000	AE-1-25	25,000	AE-1-25	15,000	AE-1-15	25,000	AE-1-25	15,000	AE-1-15
500	50,000	AL-2-50	50,000	AL-2-50	50,000	AL-2-50	25,000	AE-1-25	25,000	AE-1-25	15,000	AE-1-15
750	75,000	AL-2-75	50,000	AL-2-50	50,000	AL-2-50	25,000	AE-1-25	50,000	AL-2-50	25,000	AE-1-25
1000	75,000	AL-2-75	75,000	AL-2-75	50,000	AL-2-50	50,000	AL-2-50	50,000	AL-2-50	50,000	AL-2-50
1500	....	....	....	....	75,000	AL-2-75	75,000	AL-2-75	50,000	AL-2-50	50,000	AL-2-50
2000	....	....	....	....	100,000	AL-2-100	100,000	AL-2-100	75,000	AL-2-75	75,000	AL-2-75
2500	....	....	....	....	100,000	AL-2-100	100,000	AL-2-100	100,000	AL-2-100	100,000	AL-2-100
3000	....	....	....	....	....	....	....	....	100,000	AL-2-100	100,000	AL-2-100

Note: This table is based on unlimited power supply and 5 per cent transformer impedance.
†If cascading of feeder breakers is used, it is possible that a smaller breaker may be used for branch-feeder service.

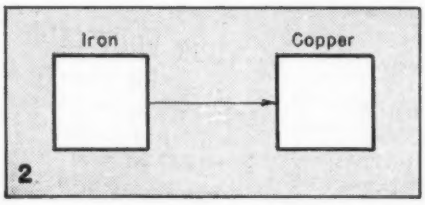
GENERAL ELECTRIC

800-31

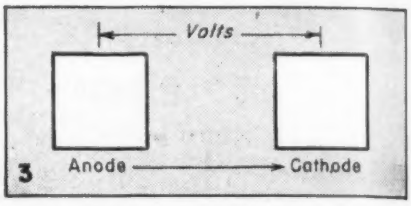
Fundamentals of



ELECTROCHEMICAL or galvanic action depends on the metals contacted by electrolyte, regardless of the nature of the electrolyte. The *rate* of action is dependent on the electrolyte, which may be any liquid or moisture. Both temperature and composition are factors in the rate of action



THE SAME ACTION takes place from zinc to iron, from iron to copper, etc., with the direction in the order of the electrochemical series



CORROSION TENDENCY between metals is measured by the electrical potential that must be applied to prevent action, which is also the voltage developed by the pairs of metals acting as electrodes in an electrogenetic cell. Corrosive action is from anode to cathode through the electrolyte

Concepts becoming better known—Mathematical prediction of corrosion rate still not possible—Both physical and chemical factors involved—Metal plus moisture starts reaction

GEORGE A. MILLS
Engineering Dept
Central Power & Light Co
Corpus Christi, Tex.

CORROSION in its most familiar form is a reaction between a metal and water. It may be represented by the equation: Metal plus water equals hydroxide of metal plus hydrogen. It is electrochemical in nature, the solution of the metal in water and the "plating" out of the hydrogen being accomplished by a flow of electricity. The reaction may be considered as being in two parts: The anodic reaction, the passing of metal into solutions; and the cathodic reaction, the plating out of the hydrogen.

Metals are listed in the electrochemical series in the order in which they replace each other chemically. Accompanying table shows the electrode potentials of metals used in electric utility plants, referred to the hydrogen electrode as zero potential.

Factors Stimulating Corrosion. Atmospheric corrosion is stimulated by a very damp atmosphere since this maintains a film of water on the metal, an essential condition for corrosion. Other factors are: Oxygen (air) dissolved in this water film; acids such as acid gases in the atmosphere or sulphur compounds from coal or oil; salts that dissociate in water producing an acid reaction; contact of dissimilar metals; and the presence on the metal of a depolarizing surface such as mill scale on iron. Any condition of non-uniformity within the metal such as may arise from improper or non-uniform annealing or cold-working favors corrosion. Similarly, non-uniformity in the concentration of the corrosive medium is favorable to corrosive attack. The same factors apply to immersed corrosion and to underground corrosion.

Corrosion due to electrolysis, not to be confused with the fact that corrosion is fundamentally an electrochemical phenomenon, is generally caused by the leakage of current from electric circuits and may take place at a point far removed from where the leakage occurs. Stray currents of feeble intensity and voltage may serve to accelerate corrosion even when they have not initiated it.

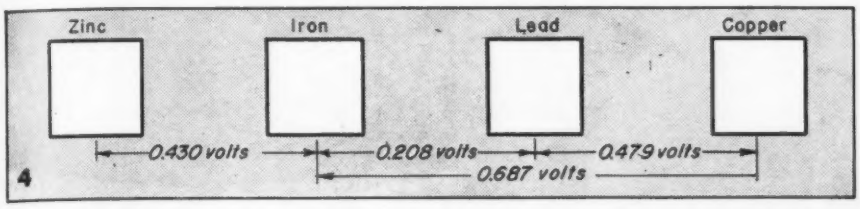
Alloys. Now that many alloys are obtainable, various combinations of alloying the basic metals will help to solve corrosion problems. The basic metals are made slightly cathodic to each other by a small amount of other metals used to alloy the base metals. For instance, where cast iron piping and bodies are used for pumps, valves, etc., in corrosive waters, a 1 to 2 percent alloy of the cast iron or steel by using copper, nickel, etc., will make the alloyed part slightly cathodic to the base metal. In this way the cathodic action can be accomplished in a passive manner.

If the device requires several different combinations of metal, each group of metals can be made cathodic to each other by increasing by 1 or 2 percent the alloying metal and thus protect the complete piece of equipment from corrosion.

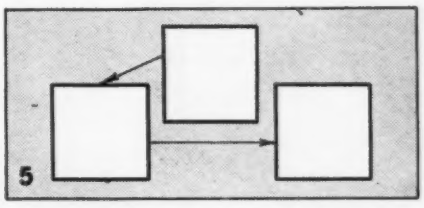
Electrode Potential of Metals

Metal As Electrodes	Potential Volts
Copper	−0.347
Hydrogen	0.000
Lead	+0.132
Tin	+0.146
Nickel	+0.200
Iron	+0.340
Zinc	+0.770
Aluminum	+1.337
Magnesium	+1.800

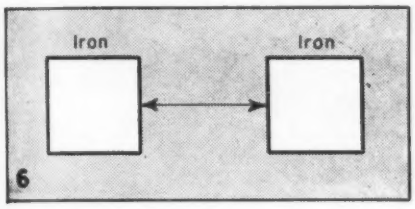
Corrosion Control



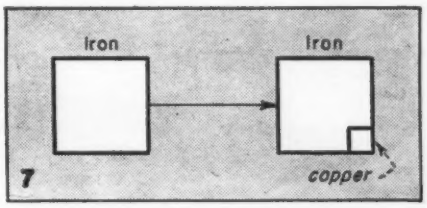
THE POTENTIAL between any two metals is the difference of their potentials in the electrochemical series. Zinc has a potential of 0.770 v and iron has 0.340 v. The potential between them is therefore 0.430 v.



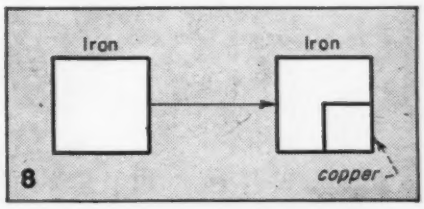
WITH THREE METALS in same electrolyte there can be two actions simultaneously, in directions governed by the electrochemical series



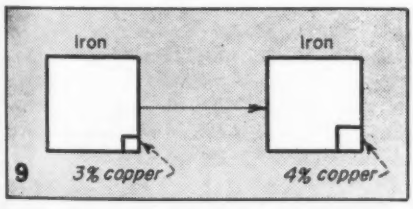
EXACTLY SIMILAR pure metals are passive because there is no electrochemical potential difference



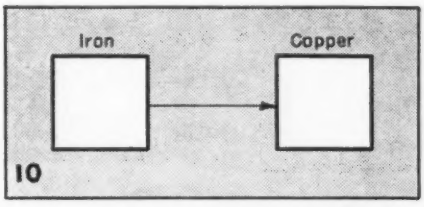
INTRODUCTION of a small percentage of metal lower in the electrochemical series makes the alloy slightly cathodic, but it may remain passive



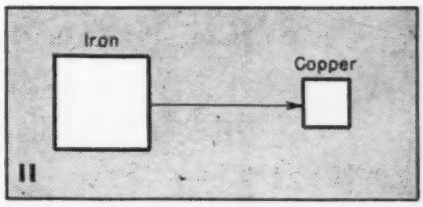
AS THE PERCENTAGE of copper is increased in this example, the electrochemical potential increases and the rate of corrosion on the base metal increases. It is possible to go too far in alloying in the presence of an active electrolyte



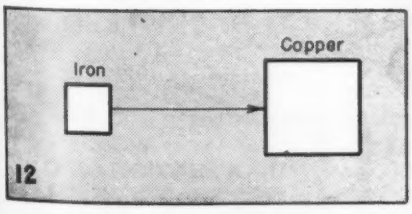
WHERE the base metal requires an alloy to protect it from the electrolyte, the mass to be made cathodic should have a slightly greater percentage of alloy metal than the base to make the corrosive action passive



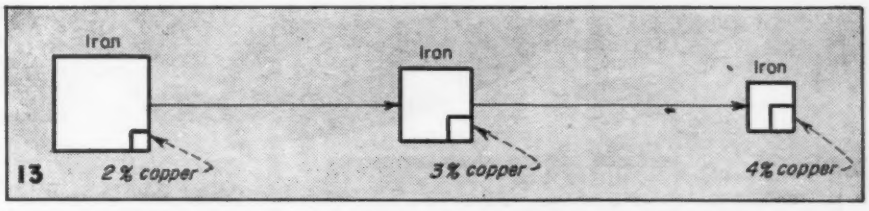
WITH EQUAL MASSES of two metals, action is in direction of the electrochemical series and rate is proportional to the potential difference



WITH SMALLER MASS of metal lower in the electrochemical series, corrosive action is less or may become passive



WITH SMALLER MASS of metal higher in the electrochemical series, rate of corrosion becomes very active

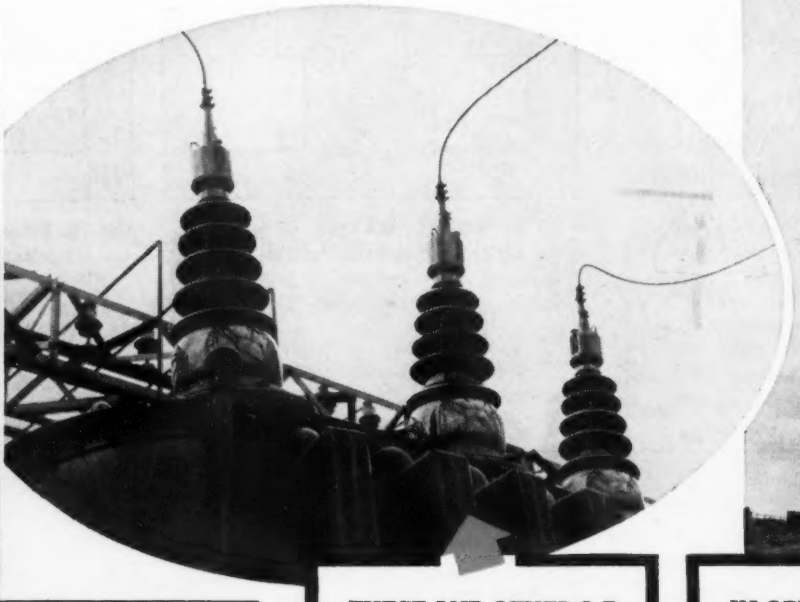


IN A COMPLEX structure, both the electochemical series and the masses must be taken into account to make the entire structure passive

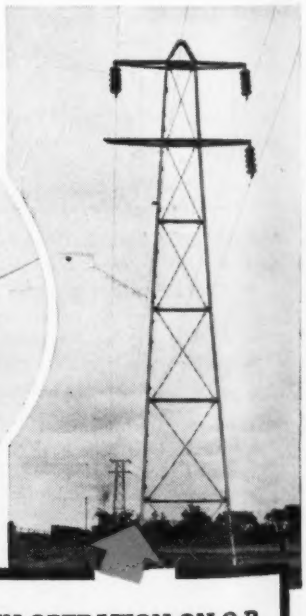
AGAIN AND AGAIN · · · FOR 34 REPEATEDLY BEEN THE CHOICE OF

--And here are just a few concrete cases of O-B insulator performance on this power company's lines that account for O-B remaining first choice, time after time!

TYPICAL OF A NETWORK of low-voltage distribution, this particular O-B pintype line has operated at 23 Kv. for upwards of 30 years.

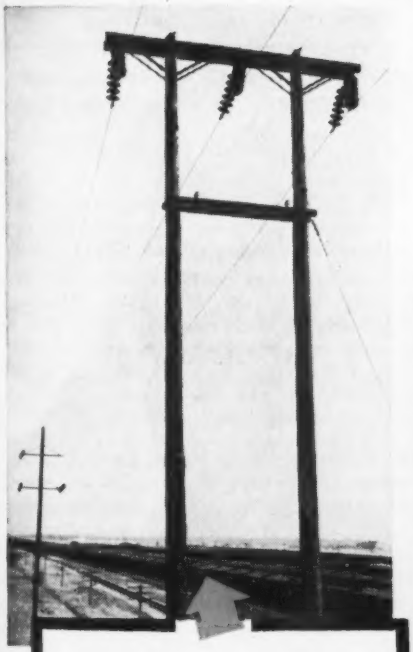


THESE AND OTHER O-B OIL-FILLED BUSHINGS are now rounding out their 20th year with no indication of ultimate life yet in sight.

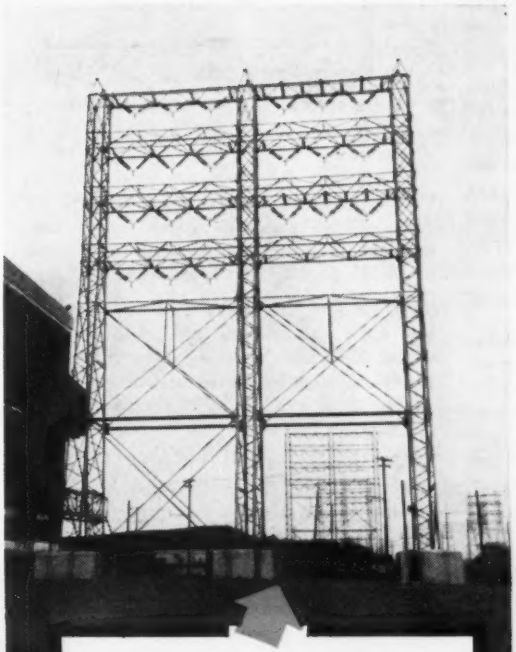


IN OPERATION ON O-B SUSPENSION INSULATORS since 1913--34 years--first at 34.5 Kv., and later at 69 Kv. Still a first-class line.

YEARS OR MORE···O-B HAS INSULATORS



AN EARLY TRANSMISSION LINE, now in its 27th year. In spite of relatively high vulnerability to lightning, the O-B insulators are given credit for maintaining acceptable service standards.



SEVEN 69-KV. CIRCUITS leave a power plant on this transmission "belt" surrounding the city. Now in its 27th year, the thousands of O-B insulators on this construction have contributed to an outstanding performance record.

ONE OF THREE MAJOR RIVER CROSSINGS. This, the first, has operated without insulation trouble since 1917--30 years. Two others; 23 and 26 years old have equal performance records. All are O-B equipped.

2750- H

Ohio Brass

MANSFIELD, OHIO

Canadian Ohio Brass Company, Limited
Niagara Falls, - - - Ontario

HEADQUARTERS FOR PORCELAIN INSULATION

How to Maintain Temperature Indicators For Generators and Large Transformers

III*—BRIDGE TYPE INSTRUMENT

W. F. DUNKLE
Supervisor of Electric Tests
Pennsylvania Power & Light Co,
Hazelton, Pa.

A TESTING and maintenance procedure for resistance type temperature indicators and accessories manufactured by Westinghouse Electric Corp.

These indicators are of the moving coil type and are to a large degree simple galvanometers scaled in degrees. The instrument spans a bridge resistance box with the unknown resistance, a 10-ohm coil embedded in the machine insulation. As the resistance of the 10-ohm coil increases with temperature rise, the bridge circuit becomes more unbalanced, thus causing the current through the galvanometer to increase the deflection scaled in degrees. The error of measurement is relatively small with reasonable care and maintenance.

1. Resistance Tests on Bridge Box. With the d-c source removed, measure accurately the resistance values of the various parts of the bridge box and record them. Resistance values from 1 to 4 and 1 to 3 should be equal to each other. The resistance 3-2 will be 14.8 ohms or 12.887 ohms depending on whether the instrument is a 200 or a 150 C full scale instrument.

Balance Point Temperature

$$= \frac{R_{2\text{-}3} - 10 \text{ ohms}}{0.0385} + 25 \text{ C}$$

= 150 C, for 200 deg full scale
= 100 C, for 150 deg full scale

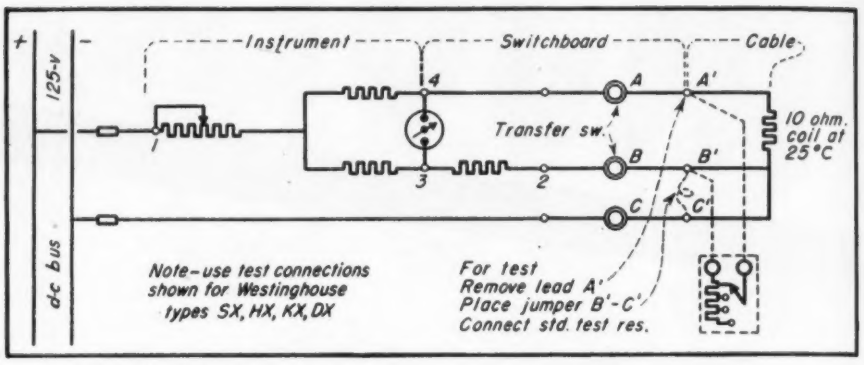
2. Routine Full Scale Instrument Test. Refer to diagram.

(a) Remove the A′ lead from the transfer switch.

(b) Substitute the standard test resistor in place of a detector coil, connect it between points marked A′ and B′ with test leads of less than 0.07-ohm resistance.

(c) Connect a jumper between points B′ and C′ on the plug receptacle.

(d) Place the voltage adjusting switch on point corresponding to the d-c station control voltage-position.



TEST CONNECTIONS for bridge type temperature indicator with galvanometer, d-c operated and actuated by change in resistance of a 10-ohm embedded coil

(e) Rotate the control knob of the standard resistor to 9.81, 10.58, 11.35, 12.12, 12.89, 13.66, and 14.8 ohms respectively, thus checking the instrument for scale error at 20, 40, 60, 80, 100, 120, and 150 C.

(f) When the instrument tests low at low scale values and high at high scale values, increase the series resistance in the positive voltage leg to the instrument. This can be done readily by changing the connections on the tapped series resistor.

(g) If the correct calibration cannot be attained in the field, remove it and send the instrument to the laboratory for rescaling. Notify the Owner Department of your proposed action for their approval and request that a work order accompany the instrument. Always send bridge box with instrument.

(h) Record "As Left" accuracy and balanced position of pointer on the instrument record card.

3. Adjustments to Instrument.

(a) Record the "As Found" accuracy and balanced position of pointer.

(b) If the instrument's accuracy at the balance "off-voltage" resistance point differs when tested by the foregoing methods, it indicates electrostatic induction, unbalanced resistance between the instrument and its exploring coil, defective insulation or protective film gaps, incorrect resistance in the bridge box, incorrect wiring or potential errors. Trace the wiring, determine and correct the cause. Make sure that contact resistance is eliminated at all junctions.

(c) When tests show that the meter reads in error by an equal number degrees at all points on the scale, shift the deenergized position of the pointer. Make sure you have adequate facilities for removing the pointer, i.e., a pointer puller. To retain the same deenergized position of pointer, the resistor in series with standard circuit must then be adjusted. Under no circumstances are you to attempt to pull a pointer off the shaft with pliers.

4. Routine Single Point Test at Operating Temperature. Measure accurately the detector coil resistance plus that of the leads to and from the coil; subtract lead resistance (measured from B′ to C′). From the remainder R, compute the corresponding temperature of the exploring coil by formula:

$$\text{Temp} = \frac{(R - 10 \text{ ohms})}{0.0385} + 25 \text{ C}$$

$$= 25.95\,R - 234.5$$

Where T = True temperature

If operating above 80 C, the instrument reading should correspond within 3 C with the calculated single point test at operating temperature and with the standard tapped resistor test.

Errors due to incorrect voltage may be calculated as follows:

$$T = B - \frac{E}{E_1}(B - T_1)$$

Where:

B = Balance point temperature
T_1 = Observed temperature
E = Noted control voltage
E_1 = Actual control voltage
T = True temperature

* This series began in ELECTRICAL WORLD, July 19, 1947, page 106.

WHERE DIAMOND VULCANIZED FIBRE FITS INTO PRODUCT DESIGN . . . . .

There is no end of profitable applications for this versatile material. It is used in a multitude of mechanical, structural and electrical applications because of its unique combination of lightweight, strength, toughness, resistance to wear and abrasion, excellent arc-resistance and good dielectric properties.

Diamond Vulcanized Fibre is available in sheets, rods and tubes which are easily and cleanly fabricated on woodworking or metalworking machinery. It can be formed and punched; cut and sawed; drilled and tapped; turned, threaded and reamed . . . or, if you wish, we can supply the parts you need fabricated to your specifications.

Long experience in fibre application engineering, in connection with our complete line of laminated (Dilecto) and molded (Celoron) plastics, enables us to render unbiased recommendations for the best application of fibre to the solution of your mechanical and electrical problems. Just call in a Continental-Diamond Technician—or write for your Continental-Diamond Fibre catalog.

C-D NON-METALLIC PRODUCTS

DIAMOND VULCANIZED FIBRE

VULCOID—Resin Impregnated Vulcanized Fibre.

DILECTO—Thermosetting Laminated Plastics.

CELORON—A Molded Phenolic Plastic.

MICABOND—Built-up Mica Electrical Insulation.

HAVEG—Plastic Chemical Equipment, Pipe, Valves and Fittings.

STANDARD & SPECIAL FORMS

Available in Standard Sheets, Rods and Tubes; and Parts Fabricated, Formed or Molded to Specifications.

DESCRIPTIVE LITERATURE

Bulletin GF gives Comprehensive Data on all C-D Products. Catalogs are also available.

D-4-47

BRANCH OFFICES: NEW YORK 17 • CLEVELAND 14 • CHICAGO 11 • SPARTANBURG, S. C. • SALES OFFICES IN PRINCIPAL CITIES
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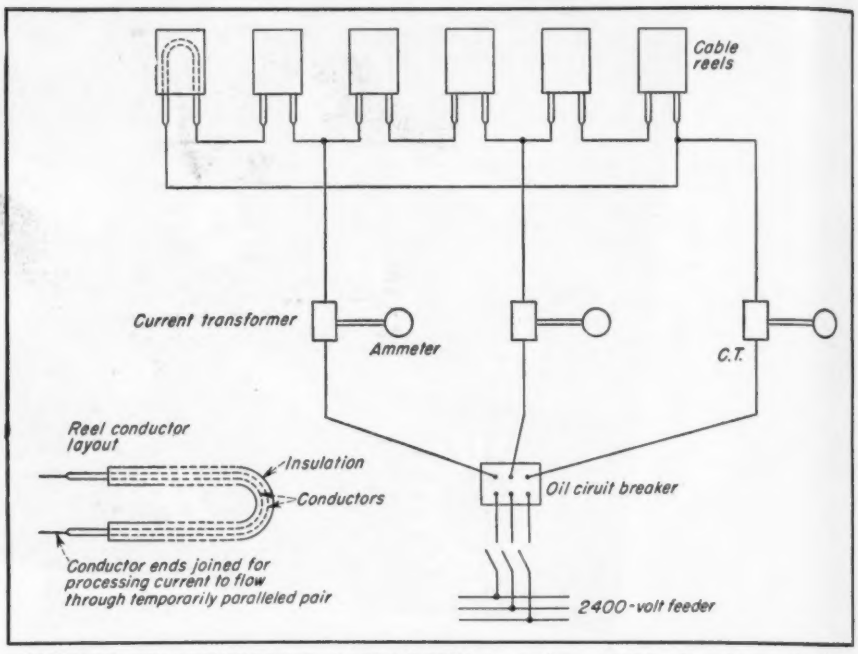
Continental-Diamond FIBRE COMPANY

Established 1895 . . Manufacturers of Laminated Plastics since 1911—NEWARK 16 • DELAWARE

Reconditioning Substation Cable

AN INDUSTRIAL PLANT in the East operating on purchased power reported a case of cracked skin on the inside surface of thermoplastic cable containing two No. 16 conductors, due to too rapid cooling by the copper when the insulation was applied hot. The plant's engineers were of the opinion that since the insulation was thermoplastic, the cracks would disappear if the affected parts were brought up to a proper temperature and then allowed to cool slowly. This treatment had to be rapid, otherwise all of the insulation might begin to flow and the cable be irreparably damaged. By experiment it was found that if the proper voltages were applied so that about 115 amp. flowed through each conductor at the start, the temperature of the copper and the neighboring insulation would rise to effect the desired reconditioning in about 55 sec. At the end of this short time, the resistance of the copper increased to a point where only about 73 amp. were flowing. The desired temperature peak in the "cure" was about 355 F.

These tests were made on short lengths of cable, using the 440-volt energy available at the factory; but the cable to be treated was in 2,500-ft. lengths. It was calculated that about 1,100 volts would force the desired current through an entire reel, provided the cable was re-reeled to meet the conditions. As the incoming primary No. 00 feeder operated at 2,400 volts, it was decided to put two reels in series across this potential, and to set up the reels so that they could be processed six at a time: two in series across each of the three phases of the 2,400-volt service, to make a balanced load. The 2,400-volt overhead feeder was tapped by leads brought down to temporary disconnecting switches mounted on a temporary crossarm accessible by a ladder, and connection made to an available oil circuit breaker mounted on a pipe frame and thence to the reels via current transformers and ammeters. The processing was done on a Sunday, when the feeder was available for this loading, and more than 75 percent of the cable was completely salvaged in a day's run. During the 55-sec. periods load averaged about 1,200 kw.



METHOD OF CONNECTING CABLE REELS to 3-phase, 2,400-volt primary feeder to provide 55-sec. "curing" current at proper voltage

• • •

A Procedure for Testing Rotating Standards

INSTRUCTIONS for testing rotating standards are a part of the meter standards of the American Gas & Electric Service Corp., New York, N. Y. The accompanying procedure is based on the instructions.

Each rotating standard used for either shop or service testing should be checked every 30 days against secondary reference standards and new corrections shall be assigned where a difference from previously determined corrections are found. No corrections for such standards should be used that have not been verified within the above period.

The secondary reference standards should be two in number having embodied in their design and construction the latest improvements for such equipment and having sufficient current and voltage ranges to cover all testing requirements of watthour meters of the various capacities in use on the system.

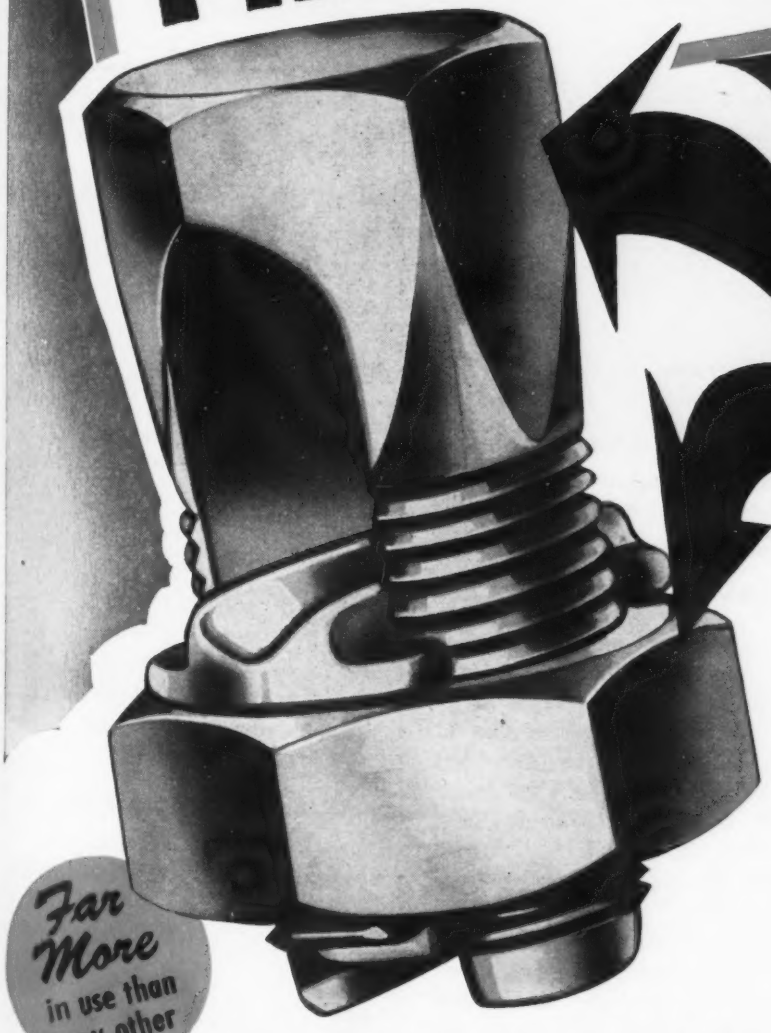
The secondary reference standards should be mounted in a permanent location free from detrimental influences and conveniently available for test connection and control. These standards shall be reserved for the sole purpose of checking the errors of the standards used for shop and service tests.

The errors or percent correction for the secondary reference standards shall be determined once every six months by means of an accurate electrodynamometer wattmeter and timing device and at any other time should their relative rates vary by more than 0.3 percent from the previously determined rates.

Meter departments not having primary reference equipment available should send their reference standards, one at a time, to the general laboratory or to some other suitable and reputable laboratory for checking.

Errors for all rotating standards should be determined for each test point at which the standard may be used within its range. In general the following test points will be required:

Here's the MOST PRACTICAL *design*



LARGER SURFACES

to grip with wrenches from ANY ANGLE—using either a socket or open-end wrench.

MAXIMUM CONTACT provided by V-groove; conductors protected by bevelled slot.

PRECISION MADE, with rigid inspection. Smooth accurate threads assure maximum pressure — permanently maintained.

Far More in use than any other

For taps, dead-ends, parallel connections, etc., in any location. Can be furnished in bronze or aluminum. Re-usable over and over.

With or without retainer.

PENN-UNION ELECTRIC CORPORATION, Erie, Pa.

Canada: Dominion Cutout Company, Ltd., 250 Richmond St. West, Toronto

The COMPLETE Line of Conductor Fittings

PENN-UNION

0.5, 1.0, 1.5, 2.0, 2.5, 5.0, 7.5, 10, 15, 25, 50, 75 amp., at unity power factor, rated or average voltages (100-125 volts or 200-240 volts) applied and at 50 percent power factor lagging at the same voltages and current values from 5 to 75 amp. inclusive. The highest test point for any standard is to be limited to the maximum allowable current for each standard. Any additional test points should be included as required.

Rotating standards used for shop and service testing should be as close to 100 percent accuracy as practicable and should not have errors in excess of plus or minus 0.7 percent (99.3 to 100.7 percent accuracy) at any test point of marked current rating and should be corrected where necessary by cleaning and adjustment of the rotating standard.

When checking rotating standards against the secondary reference standards, both reference standards should be in the circuit and read simultaneously in order that any divergence in their certified rates may be noted and investigated. All readings pertinent to such tests should be noted.

When rotating standards are tested, their accompanying test leads should be carefully examined and maintained in first class condition. Special attention should be given the potential test switch to be sure that the switch contact resistance is not sufficient to influence the test results when testing at 50 percent lagging power factor loads. In general the potential switch contact resistance should be imperceptible with the usual resistance measuring device. An ohmmeter or bridge is convenient for checking this resistance.

• • •

MECHANIZED CABLE-LAYING using a combination unit that furrows the ground, lays the cable and backfills the trench. When necessary the tractor-drawn plow is used with a rooting share to remove obstructions prior to laying of the cable

Triple-Duty Plowtrain Lays Cable

A THREE-OPERATION machine developed by the American Telephone and Telegraph Co cuts a slot in the ground 5 in. wide; lays lead-covered cables as large as 3½ in. OD to a maximum depth affording earth coverage of 60 in. and at rates as fast as 2.5 mph; and backfills the trench as the plowtrain progresses. A rooting operation is necessary in most localities to lift and remove rocks and other obstructions prior to cable laying.

Nicknamed "Mickey Mouse," this plow was built by Arthur Reyberger and Son, of Newark, N. J. It is about 12 ft high and, with the control trailer, weighs 27 tons. Plow and trailer together measure 50 ft in length. They are drawn by two or more Caterpillar 20-ton diesel tractors. The share is positioned between the rear wheels of the plow. Different types of shares are used for the rooting and cable-laying operations. Hydraulic mechanism, controlled from the trailer coupled at the rear of the plow, moves the shares up and down and also adjusts the angle of their approach, thus controlling the depth at which the cable is laid. If the blade comes up against something like an immovable ledge of rock, a relief valve in the hydraulic mechanism "blows" when the drawbar pull reaches 100,000 lb, reduces the pressure and releases the plowshare from the obstruction.

Cable to the trench is fed over a sheave in the plowshare and supplied from a reel on a trailer at the end of the train. Full cable reels are brought to the rear of the train by an additional Caterpillar tractor and are loaded on the trailer by means of a steel winch rope from the tractor ahead of the plow. The cable reel trailer has a V-shaped scraper to backfill the trench.

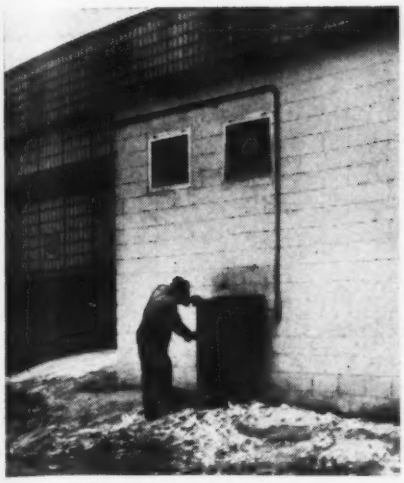
Minimum crew is about eight men including three for operating the tractors. Train shown is laying coaxial cable for telephone and television service between Washington and Philadelphia.

How to Protect Tower-Painting Date

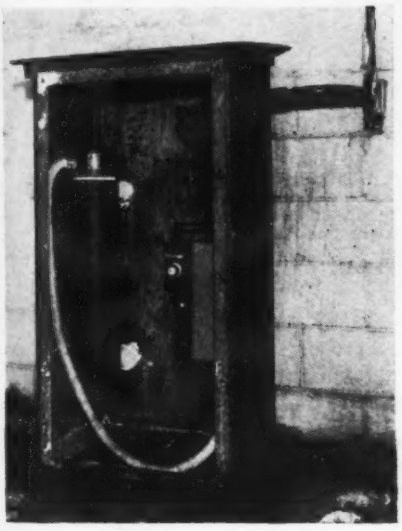
DATE of the last over-all painting job done on the towers of an eastern utility is stenciled on the inside of the angle member used as the tower leg. In that position the date has more protection from the weather. This method has been in use for more than five years. It serves as a local reference at the tower for the job and at the same time aids the engineers and maintenance men to estimate, to test, to prove and record paint experiences and expenses.

Bus Bar Bender

BENDER made from salvage material has been found effective by C. C. Brownsbuger of New Orleans Public Service for shaping bus bars for transformer vaults



ELECTRIC WATER HEATER is installed on outside wall of acetylene generator house. The generators are housed in a separate building



HEAT SOURCE is a 6-kw immersion unit in small tank. Tank and control equipment are shown. Closed circulation system heats gas house

tank which, with its switch and control equipment, is enclosed in a metal cabinet set against the outside of the building. Temperature inside the house is automatically regulated to 50 F. This arrangement for heating, plus explosion-proof lighting, adds much to safety of the acetylene production.

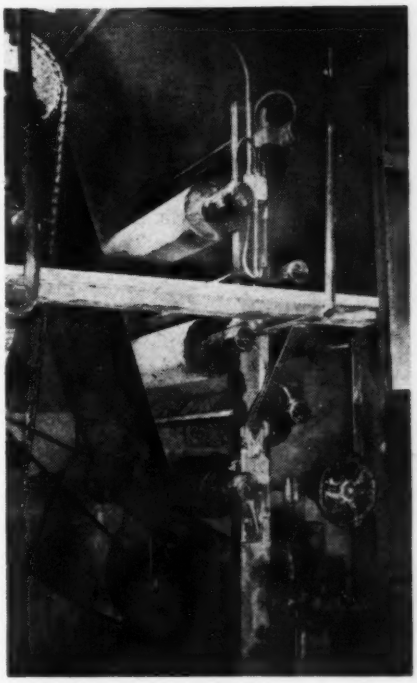
•

Electric Heat Keeps Tar from Sticking

ELECTRIC HEATING of the rolls around which tarred roofing paper passes in the process of manufacture proved the best solution to the problem of keeping the tar from sticking to the cold idler rolls in a Portland, Ore., factory. The six upper rolls as shown in the accompanying illustration are those that are heated. At the time the picture was taken the paper was not passing around these rolls because of the very thin coating of tar being applied on the particular run being made.

Paper Tarring Process

The process in making roofing paper is to pass the heavy paper stock through a hot asphalt tar bath; then between two calender rolls; around the electrically heated rolls, and then to a traveling drying and cooling rack. Speed of the paper is about 200 fpm. Method of heating the 10-in. diameter, 4-ft rolls was to place long hairpin Wessix elements through the hollow shaft of the rolls. Elements are rated 1,800 w each, at 220 v. Service is supplied by Northwestern Electric Co.



ROOFING PAPER MACHINE uses electrically heated rolls to prevent tar from sticking to cold rolls

Cold Cathode Tailored to the Job

Cutler Light Mfg. Co.

ADAPTABILITY OF COLD-CATHODE FLUORESCENT to achieve the effect desired is well illustrated by this installation in a store of the Crawford Clothes Co in Philadelphia. Tubing of special design winds with the stairways from the basement to the mezzanine and directly into the ceiling light patterns. This picture shows the long four-tube run around the ceiling of the mezzanine and down the stairway in the left background. The rectangular panels in the ceiling each contain sixteen 25-mm tubes which are operated at 200 ma for high intensity. Illumination in the store ranges from 50 to 75 ft-c.

NEW EQUIPMENT

Cooking Top Designed For Built-In Range

DESIGNED to be set into a counter top at any preferred height, a one-piece cooking top has been developed by Thermador Electrical Manufacturing Co, 5119 South District Blvd, Los Angeles 22, California. The device consists of three heating units and a 5-qt. deep-well cooker, all with five-heat switches. It is constructed of stainless steel, measures 17½ in. wide by 45 in. long and has a ¾-in. rise for the switch panel. The rough-in box is 10¾ in. deep and the whole is installed in a cabinet, forming a built-in range to conform with individual taste and structural limitations.

A conduit with only three wires is run into the existing cabinet. The rough-in box is lowered into the cabinet well, wiring is connected, the cooking top is secured by four screws and the range is ready for use.

•

Standardized Switchboard Of All-In-One Type

MAIN SERVICE PROTECTION and subfeeder units in one compact switchboard for electrical distribution, with provisions for utility's meter, current transformers, and test facilities, is now a standardized line of Mullenbach Electrical Manufacturing Co, 2300 East 27th St, Los Angeles 11, Calif. The assembly is totally enclosed in 30 x 90 x 14 in. standard die-formed, gusset-welded, 12-gage stock enclosure, with the company's new standard Grey Hamertone Baked Enamel finish.

Standardized units may be either fusible type Vacu-Break switch unit or industrial type air circuit breaker unit, or combination, in 15- to 400-amp sizes; the quantity and amperage of units is determined by the installation's particular needs. Because of standardized design of enclosure and units, the manufacturer reports that the board may be assembled within a few hours after order is placed. Provisions are made for cross-bussing, at a later date, to additional distribution sections, as changes in installation's requirements demand.

Small "Butterfly" Type Variable Capacitors

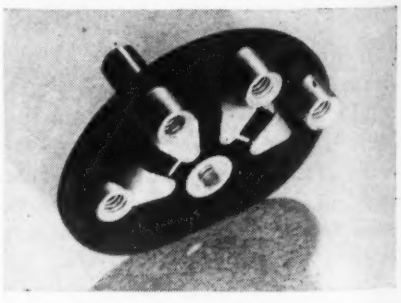
KNOWN as type JCX, a new line of variable capacitors introduced by Barker & Williamson, Inc. 237 Fairfield Ave, Upper Darby, Pa., incorporates the following construction features: Opposed stator sections to provide short r-f paths, and butterfly rotor construction that permits grounding rotor at the center of the r-f voltage point with respect to stators. Coils can be mounted directly on the capacitors for maximum efficiency.

The units are said to have 25 percent of the frontal area of the company's heavier type CX capacitors and are designed especially for medium-powered triode or tetrode stage plate circuits where modulated plate voltage does not exceed 1,250 v and unmodulated plate voltage is not more than 1,500 v. The airgap is 0.125 in.

The capacitors have stainless steel shafts and tie rods and heavy rounded aluminum plates. Three standard types are available in capacities of 100 mmf, 50 mmf and 25 mmf per section, and in mounting lengths of 5½, 3⅜ and 2¾ in. respectively.

•

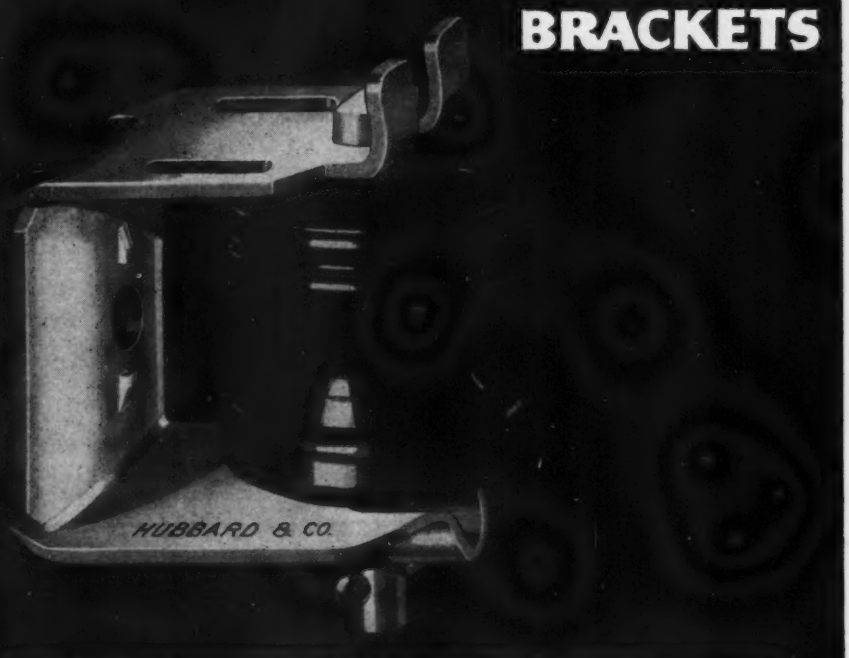
Voltage Change Switch Designed for Motors

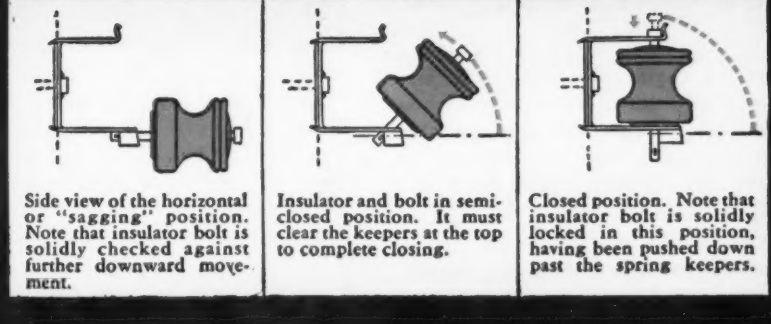


DEVLOPMENT of a motor voltage change switch has been completed by P. R. Mallory & Co, Inc, Indianapolis, Ind., thereby making possible the universal application of fractional horsepower motors. Selection for operation on 110-v or 220-v a-c line source is accomplished by switching the field windings of motor at initial installation

Something NEW IN SECONDARY DISTRIBUTION

HUBBARD SAGGER BRACKETS

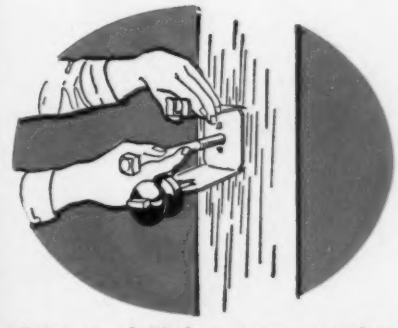




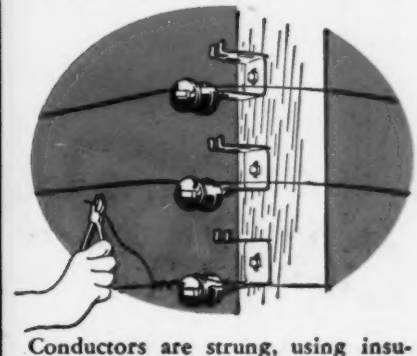
Side view of the horizontal or "sagging" position. Note that insulator bolt is solidly checked against further downward movement.

Insulator and bolt in semi-closed position. It must clear the keepers at the top to complete closing.

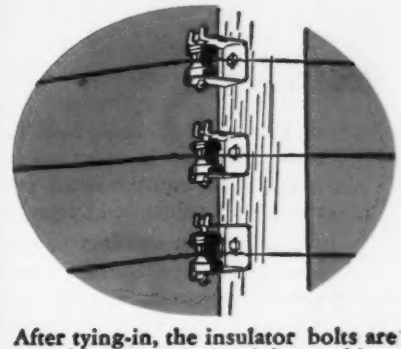
Closed position. Note that insulator bolt is solidly locked in this position, having been pushed down past the spring keepers.



Holes are drilled at correct spacing and machine bolt is inserted as shown.



Conductors are strung, using insulators as pulleys, until desired sag is obtained after which they are tied-in while still in the horizontal position.



After tying-in, the insulator bolts are raised to the vertical and dropped into the lock position.

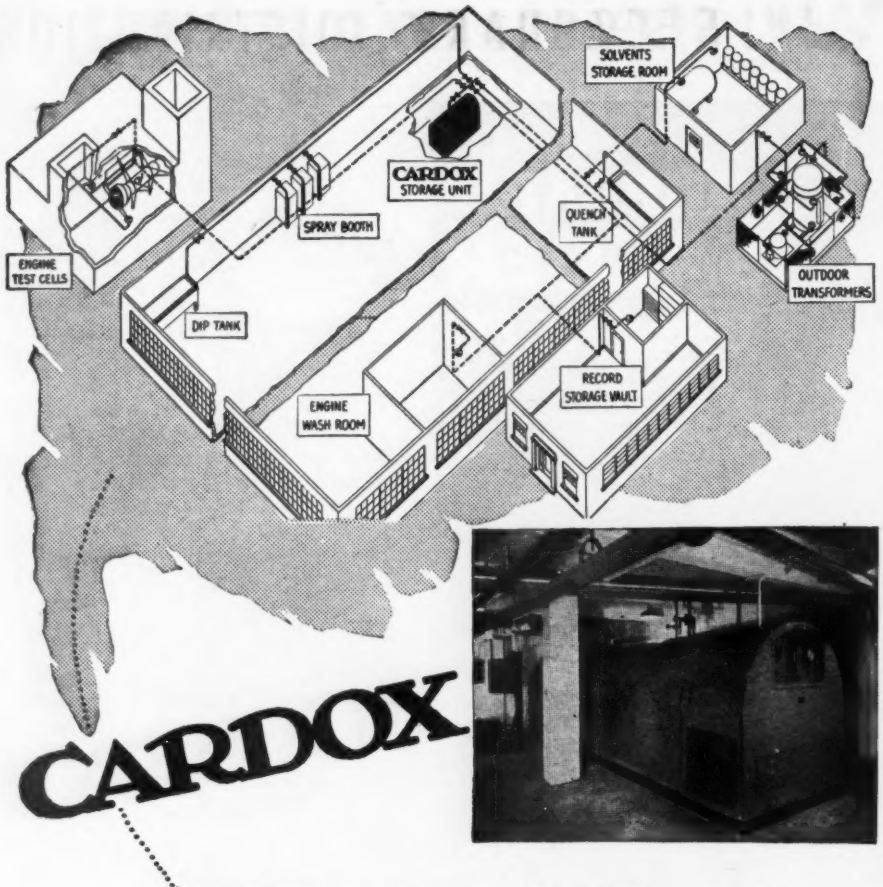
For secondary distribution circuits, where a variety of problems are to be met, Hubbard No. 710 Sagger Bracket is the most flexible choice to meet the requirements. This Bracket may be described as a single, *separate,* secondary-rack point, which may be used with one or more similar points, at any desired spacing for any number of conductors.

No. 710 Brackets are versatile in other ways also. The patented feature is the arrangement of the insulator bolt which may be dropped to a horizontal position to allow the "sagging" of conductors with the insulator spool acting as a pulley. Insulator Bolts are locked in position when closed or open. Strength against line pull is provided by the broad back bearing against the pole, the backs being 3-inches in width. Spurs at the corners prevent the bracket from turning during and after installation. Bolt heads are trapped in the back to prevent turning while tightening.

Hubbard Sagger Brackets have been tested and proved in service. Highly adaptable to any conditions, they have drawn praise from engineers, in every instance of the many installations made to date.

HUBBARD AND COMPANY

PITTSBURGH • CHICAGO **OAKLAND • CALIFORNIA**



CARDOX

GIVES DOUBLE PROTECTION FOR TOUGH FIRE HAZARDS

DOUBLE—because the Cardox method of engineered application and control makes it entirely practical to provide enough fire-killing carbon dioxide to give "*double-shot*" safety to the largest hazard protected, multiple shot protection to other hazards covered by the system. This *ample reserve* that means uninterrupted protection *after* fire has been extinguished is a recognized principle of sound Cardox fire engineering.

DOUBLE—because *mass* application of Cardox CO_2 in *pounds* or *tons* means less fire damage. Burning time is cut to a minimum. Non-damaging carbon dioxide cannot harm costly equipment or material in process. There is no after-fire clean-up to cause costly production delays.

Cardox Fire Extinguishing Systems use low-pressure carbon dioxide—stored at 0° F. and relatively low pressure in a single, compactly designed, centrally located Storage Unit that holds from ¼ to 125 tons. The Cardox method of application and control and Cardox engineered equipment have broadened both the performance and protection scope of carbon dioxide—providing *all* the proved advantages of CO_2 extinguishment for tough fire hazards, single or multiple, large or small, indoors or out.

Why not determine for yourself whether this broadened application of carbon dioxide by Cardox Systems or mobile equipment may not be the most effective answer to the fire problems that concern you? Write for Bulletin No. 547

CARDOX CORPORATION
BELL BUILDING • CHICAGO 1, ILLINOIS
District Offices: New York • Philadelphia • Pittsburgh • Cleveland • Detroit • Los Angeles San Francisco • San Diego

CARDOX

CO_2 FIRE EXTINGUISHING SYSTEMS

when it is under no-load conditions.

As a line voltage setting device, the switch has two positions—one connecting two field windings in parallel for 110-v operation, and the other connecting the two windings in series for 220-v operation.

The switch is said to be capable of withstanding normal motor vibration. It is equipped with terminals that may serve as junctions for the line and field winding loads. Both the stator and rotor have phenolic base. The standard shaft is milled to fit ⅝-in. open-ended wrench. The shaft end may be machined to specifications.

•

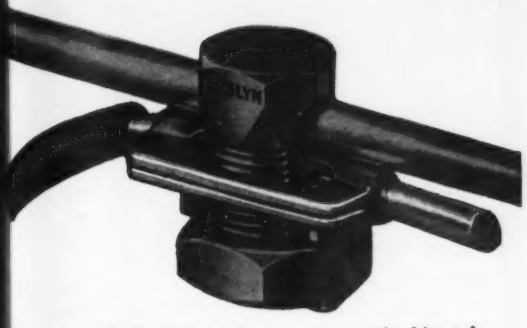
Motorized Lawn Mower Has Rotary Blade

THE Pioneer electric mower built by Louisville Electric Mfg Co, Louisville, Ky., has a 12-in. rotary cutting blade made of steel, mounted directly on motor shaft and shielded on top and all sides by mower frame. Cutting height is adjustable from 1⅛ to 2⅛ in. Motor is an enclosed vertical universal type rated ⅓ hp, 115 v, 7,500 rpm, to which is connected 50 ft of No. 18, two-conductor, rubber-covered cord. Upper end of wood handle has a trigger switch which is held in "on" position by finger pressure; releasing finger opens circuit to motor. Mower weighs 35 lb and cuts when it is pushed forward or pulled backwards.

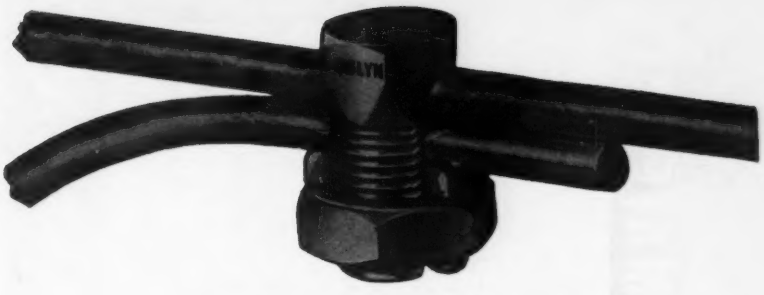
•

Small Battery Chargers For Farm and Home Use

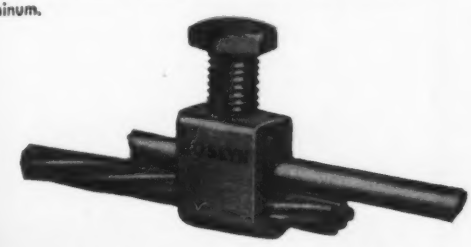
TWO LIGHT-WEIGHT battery chargers that will charge the average rundown battery on the farm or in the home in 24 hr or less have been announced by General Electric Co., Bridgeport, Conn. Known as the "Overnite" and the "One Day," the new selenium-rectifier-type chargers are constructed so



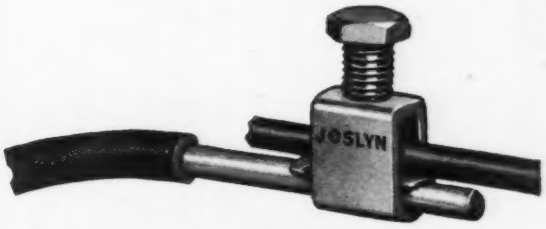
No. J3662—Universal connector with bimetal washers with No. 2 solid copper and No. 4 solid aluminum.



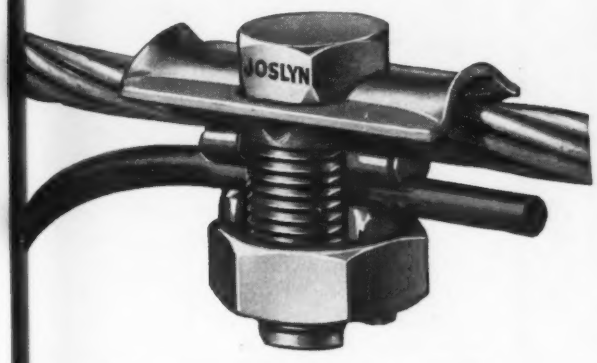
No. J3602—Standard connector with No. 2 solid copper wire.



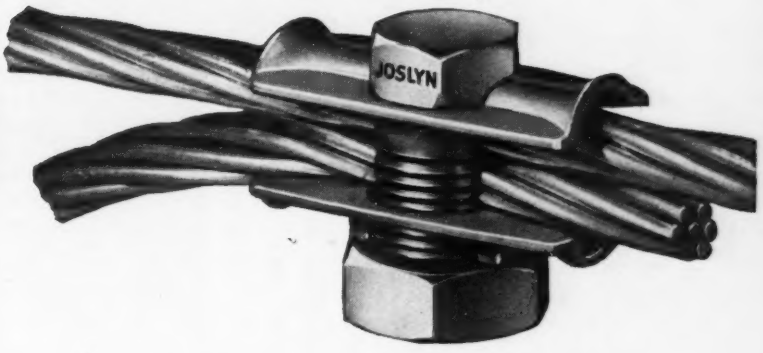
No. J3668—Service entrance connector with No. 6 solid and No. 6 stranded copper.



No. J3636—Service entrance connector with No. 6 solid copper and No. 6 solid aluminum.



No. J3627—Aluminum connector with bell mouthed washer and spacer with No. 2 ACSR and No. 4 solid copper.



No. J3616—Aluminum connector with bell mouthed washers with No. 4 ACSR.

FOR COPPER AND COPPERWELD CONDUCTORS

Stock No.	Maximum Wire Size AWG Solid	AWG Strand	Copperweld
J3608	8	8	....
J3606	6	8	8A-9½D 3 No. 12
J3604	4	6	6A
J3602	2	3	4A
J3622	1	2	....
J3610	2/0	1/0	2A
J3620	3/0	2/0	....
J3640	4/0	4/0	....
J3635	350 MCM		....
J3650	500 MCM		....
J3675	750 MCM		....

FOR ACSR CONDUCTORS

ACSR to ACSR with 2 bell mouthed washers

Stock No.	Maximum Wire Size ACSR	AWG Copper
J3616	4	....
J3617	2	....
J3619	1/0	....

ACSR to Copper with 1 bell mouthed washer and 1 separator

J3625	6	No. 4 Strand
J3626	4	No. 4 Strand
J3627	2	No. 3 Strand
J3629	1/0	No. 1 Strand

offices in principal cities

THE JOSLYN CO.
SOUTH EAST-JOSLYN CO.
SOUTHERN JOSLYN CO.
JOSLYN SOUTHWEST CO.
JOSLYN COMPANY OF CALIFORNIA
JOBBERS SUPPLY CO.

JOSLYN MFG. AND SUPPLY CO.

Complete Pole Line Equipment

20 NORTH WACKER DRIVE, CHICAGO 6, ILL.

LOOK TO LOCKE...FOR Convenient Stocks
OF DISTRIBUTION MATERIALS
A Complete Line
of distribution materials—pole line hardware and insulators — is maintained at each of many different points throughout the country in Locke's regional stocks and in distributors' warehouses. There's one convenient to you.
In these times of increased demands, temporary shortages of a few insulators may exist in certain locations, but continuously adjusted production schedules quickly remedy such conditions.
Depend on Locke for Quality Controlled distribution materials . . . pole line hardware and insulators. One order covers both.
Locke
POLE LINE HARDWARE and INSULATORS
LOCKE INSULATOR CORPORATION • BALTIMORE 3, MARYLAND

that they may be used without removing the discharged battery from the vehicle during the charging operation.

The "Overnite," designed for farm use, will charge the average truck, car or tractor battery in 12 hr or less. The "One Day" will bring the normally run-down automobile battery up to operating efficiency within 24 hr. Both chargers are small and light enough to be mounted on a shelf or wall. The "Overnite," the larger of the two, measures 7¼x5x6 in. and weighs 10 lb.

Charging rate of the new units is automatically tapered from high to low, as the battery becomes fully charged. A pilot light indicates when the chargers are operating.

•

Turntable Positions Parts for H-F Heating

AVAILABILITY of an automatic turntable for continuous soldering, brazing and annealing of small ferrous and nonferrous parts has been announced by Lepel High Frequency Laboratories, Inc, 39 West 60th St, New York 23, N. Y. Small cup-like receptacles are mounted on the table, and automatically revolve as they carry the parts to be treated through the load or heating coil. The turntable is used with a high-frequency generator and is powered by a ¼-hp, 115-v, 60-cycle motor; its speed can be varied from 0.5 to 3 rpm. Manufacturer reports that any heating temperature can be attained on a production line basis and as many as 68 parts per minute can be processed.

•

1-Hp A-C Motor Added to Line

ADDITION of a 1 hp a-c motor to its line has been announced by Eicor, Inc, 1501 West Congress St, Chicago 7, Ill. Starting torque is reported to be three imes full load torque; in addition power equal to twice full load torque is instantaneously available to take care of momentary overloads. Other features include: drip-proof and grease-proof

Keep Electrical Equipment Operating Without Sacrificing Protection

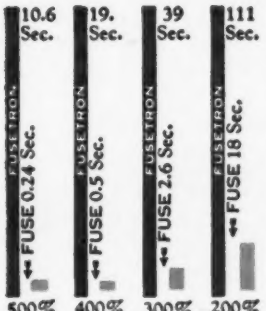


Chart shows 30 ampere 250 volt fuses. Other sizes and 600 volt ratings show similar results.

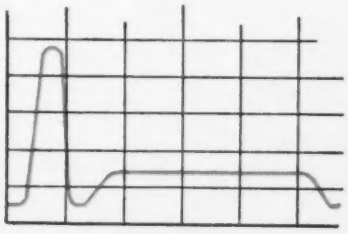
Buss Fusetrons have tremendous time-lag. They *can* hold harmless overloads, yet provide protection against dangerous overloads or short-circuits because they combine a fuse with a thermal cutout.

Here's how the time-lag of Fusetrons compares with that of ordinary fuses:

It is readily seen from this chart why Fusetrons hold harmless overloads and keep circuits operating instead of opening and causing useless shutdowns. Ordinary fuses and other protective devices cannot do this job.

Here's how Fusetron time-lag will work for you. AC motors require a current of 3 to 9 times their rating for starting. This surge of current often causes ordinary fuses to open.

Fusetrons have the capacity to absorb this high starting current without opening, even when the type of load causes starting current to hang on for limited periods.



In normal operation overloads often occur that are heavy but short lived—or light overloads hang on. In either instance they are harmless—yet they may cause ordinary fuses to open.

Fusetrons hold such harmless overloads—and keep circuits in operation.

Fusetrons Also Prevent Needless Blows on Mains and Feeder Circuits

Even when all motors on a circuit start at one time, Fusetrons will not open. For example: four 15 ampere motors on a circuit would ordinarily be protected by 90 ampere fuses. If these 4 motors start at one time the combined starting current is approximately 360 amperes. At this load a 90 ampere fuse would open in about 3 seconds—before the motors could start—BUT A 90 AMPERE FUSETRON WILL HOLD 24 SECONDS, ample time for all motors to start.

So, with Fusetrons installed in the mains, feeders and all branch circuits, shutdowns caused by needless opening of fuses or other forms of protective devices on harmless overloads are entirely wiped out.

Fusetrons Give Many Other Kinds of Protection Heretofore Not Available

What is a FUSETRON?

The Fusetron is a DUAL element device—a Fuse to which is added a Thermal cutout.

The result is a fuse with tremendous time-lag and much less electrical resistance.

Fusetrons have the same degree of Underwriters' Laboratory approval for both motor-running and circuit protection as the most expensive devices made.

Made to the same dimensions as ordinary fuses, Fusetrons fit all standard fuse holders.

Obtainable in all sizes from 1/10 to 600 ampere in both 250 and 600 volt types. Also in tamper-resisting type (Fustats) for 125 volt circuits.

Their cost is surprisingly low.

Fusetrons do everything fuses do, as is confirmed by the Underwriters' Laboratories' Label, and in addition...

★ Provide simplest way to stop burnouts from single phasing. ★ Make burnout protection of SMALL motors simple and inexpensive. ★ Give thermal protection to panelboards and switches. ★ Prevent needless blows caused by heating in panels and switches. ★ Permit use of larger motor or adding more motors on circuit without installing larger switch or panel. ★ On new installations, proper size switches and panels can be used instead of oversize. ★ Protect motors against burnout. ★ Give double burnout protection to large motors. ★ Protect coils, transformers and solenoids against burnout.

Get All The Facts—Get Better Protection Send The Coupon Now

Only one shutdown, or one lost motor or one destroyed panel may cost you far more than replacing every fuse with a Fusetron.

Don't risk such losses—protect your production schedules by changing your entire electrical system to FUSETRONS.

BUSSMANN MFG. COMPANY, University at Jefferson St. Louis 7, Mo.
(Division McGraw Electric Co.)

FUSETRONS

SOLD THROUGH WHOLESALERS

BUSSMANN MFG. CO., University at Jefferson St. Louis 7, Mo. (Division McGraw Electric Co.)

Please send me complete facts about BUSS Fusetrons.

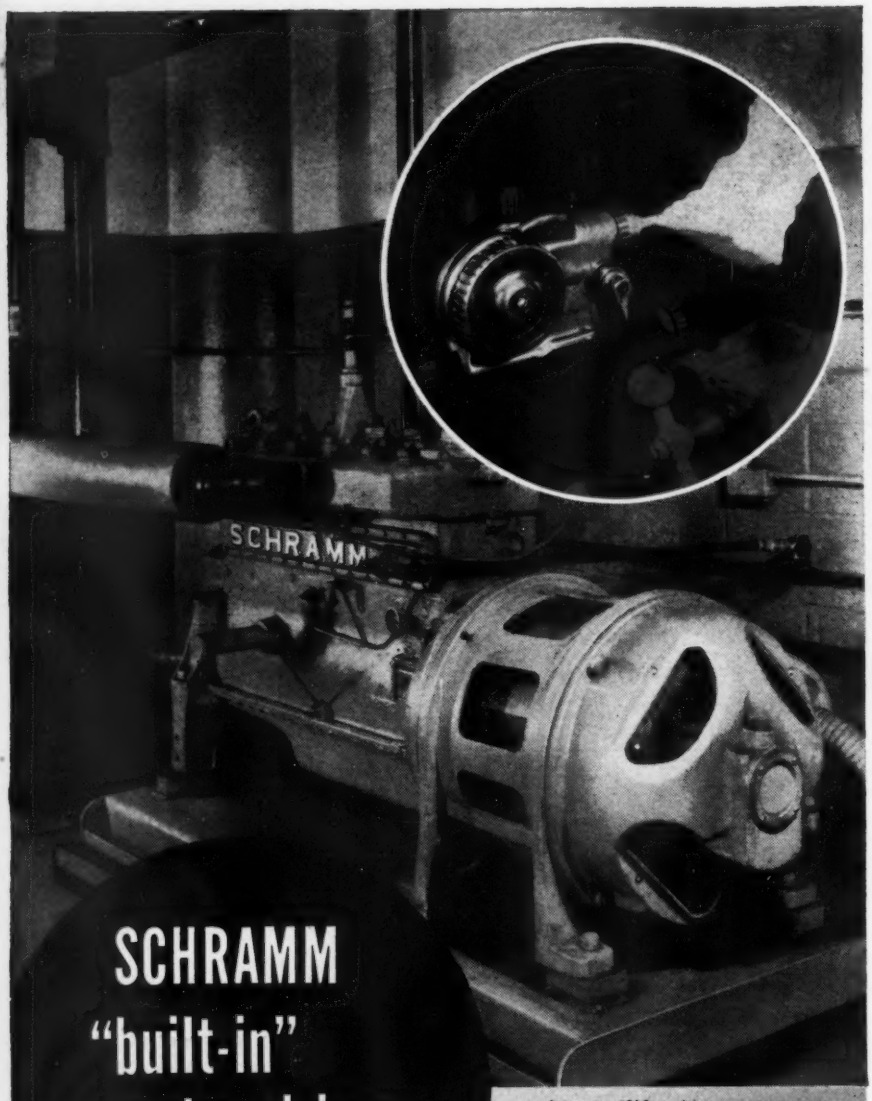
Name_____

Title_____

Company_____

Address_____

City_____ State_____ 847



SCHRAMM
"built-in"
motor driven
compressor

Schramm #210 stationary compressor operating metallizing gun and other pneumatic tools in the plant of the Metallizing Engineering Company, Long Island City, New York.

Reclaiming defective castings . . . a process developed to enable foundries and machine shops to effect a positive repair of defective aluminum castings. May also be used for reclaiming bronze, grey iron, malleable iron, as well as steel castings.

This is only one of the hundreds of different applications of compressed air for industrial and manufacturing plants as furnished by the Schramm heavy-duty, continuous service, built-in motor or "V" belt drive compressors ranging from 2½ to 600 cu. ft. displacement.

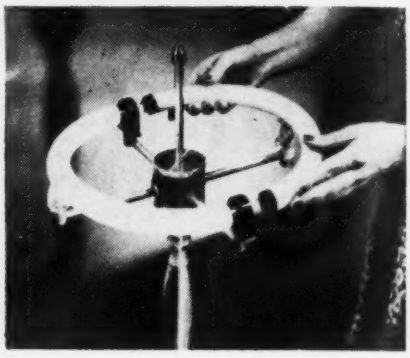
Write for catalog 45A.

SCHRAMM INC.
THE COMPRESSOR PEOPLE
WEST CHESTER
PENNSYLVANIA

protective armor; clock- or counter-clockwise rotation; full rated power delivered within limits of plus or minus 10 percent of rated voltage. Motors, single and polyphase types, are designed for operation on either 115 or 230 v. Also available are ½- and ¾-hp motors.

•

Semi-Circular F Lamp Offered By Westinghouse

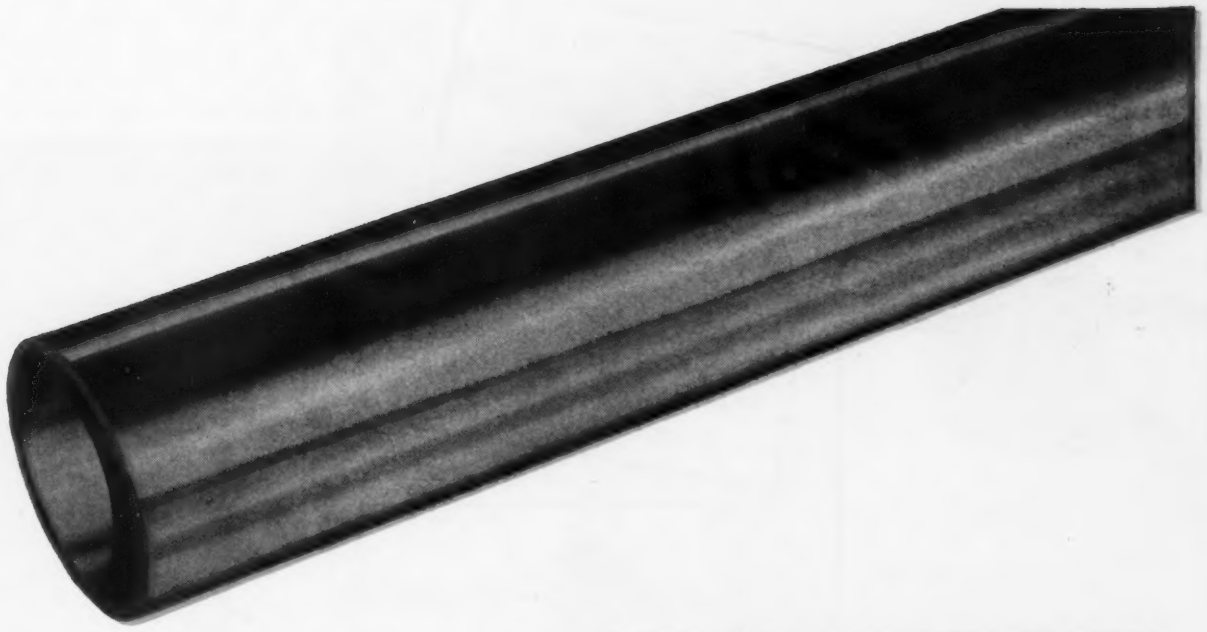


BY RESORTING to a semi-circular shape in its new "Circlarc" fluorescent lamp, the lamp division of the Westinghouse Electric Corp has overcome some of the stubborn problems of production and application besetting the full circular fluorescent lamp. For example, the semi-circular lamp can be adapted to mass production machinery unlike any but the straight-tube, it is stated. In the field of application the Circlarc can be used to encircle structural pillars. It is readily adaptable to portable lamp designs. To the designer of commercial fixtures it offers a means of rounding out the frequently coffin-like ends of straight-tube luminaires. The Circlarc is an 18-w white lamp using a 1-in. tube bent in half a circle of 12 in. diameter. Initial lumen rating is 710. A two-pin plastic base at each end of the lamp connects it to the circuit. Base pins are set at 45 deg to the plane of the lamp, a feature making for easy relamping. The arc stream of each lamp is short so it may be operated directly from 110-125-v a-c lighting circuits with a small choke as a ballast.

•

Safety Belt for Tree Jobs

A SAFETY BELT designed for use when working on trees and made of 4-ply cotton webbing, moisture proofed and mildew treated, stitched and riveted, has been announced by Buckingham Manufacturing Co, Binghamton, N. Y. Belts Cat. No. 1302-S (standard size) and 1302-L (large size) have broad webbing of the saddle and the back is faced



Copper Tubes

FOR HIGHEST A. C. EFFICIENCY...

TUBULAR SHAPES offer the lowest impedance to the flow of alternating current. Watt losses are accordingly low by comparison with other conductor shapes.

Greater rigidity . . . the possibility of increasing current capacity by water or oil cooling . . . comparatively low corona discharge at high voltages . . . are other advantages offered by tubular conductors.

In this as in other shapes, copper is generally recognized as the most satisfactory bus material. For in addition to high electrical and thermal conductivity, copper provides strength, toughness and corrosion resistance.

For detailed information on the range of sizes and shapes in which Anaconda Bus Conductors are furnished, write for Publication C-25. 47104

BARS require minimum space, may be bent or twisted, connected to apparatus without special joint preparation and in laminated construction have unlimited d.c. capacity.
TUBES provide the highest bus conductor efficiency at a.c. frequencies, have greater rigidity, and may be oil or water cooled.
CHANNELS have large surface area, reduce temperature rise, provide greater rigidity than tubes for long runs and have flat surfaces for tap-off.
ANGLES for ventilated hollow busses have highest rate of heat dissipation, handle greater current density, but require more space for installation.
CABLES solve many problems in conducting extremely heavy currents in confined space or in connecting moving apparatus such as furnaces of the arc or resistance types.

ANACONDA
from mine to consumer

Anaconda

BUS CONDUCTORS

THE AMERICAN BRASS COMPANY

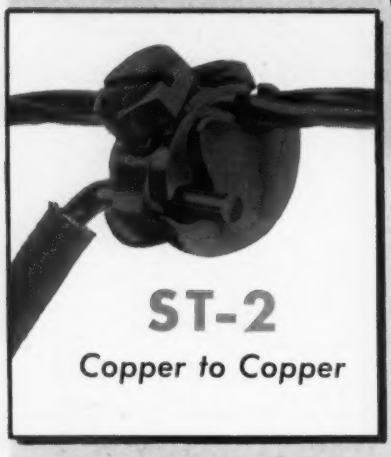
General Offices: Waterbury 88, Connecticut

Subsidiary of Anaconda Copper Mining Company

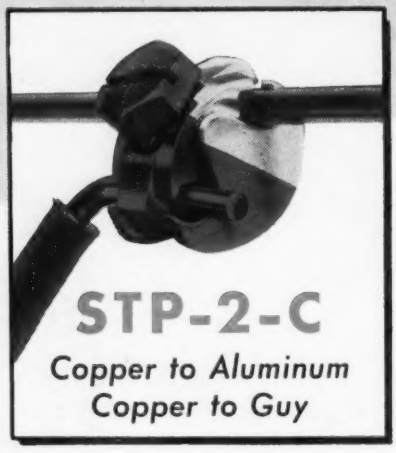
In Canada: ANACONDA AMERICAN BRASS LTD.
New Toronto, Ont.

Anderson Service Taps are available to cover a wide range of conductor sizes.

STP-2
Aluminum to Aluminum
Aluminum to Guy



ST-2
Copper to Copper



STP-2-C
Copper to Aluminum
Copper to Guy

Anderson

SERVICE TAPS

Anderson Service Taps reduce inventories because each size accommodates several wire sizes. High-compression connections insure long, trouble-free service. All Anderson Service Taps have high conductivity.

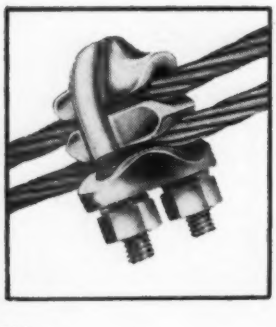
No bimetallic inserts are needed with aluminum conductors. Electrolysis is reduced to a minimum because the aluminum wire cannot come in contact with metal having marked difference in potentials.

Vibration tests and use in the field have demonstrated the dependable qualities of Anderson Service Taps. Electric utilities used more of these handy service taps last year than ever before.

Anderson Brass Works, Inc.

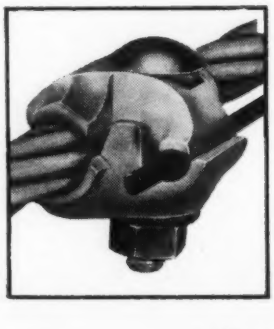
Birmingham, Ala., Representatives in Principal Cities

Manufacturers of Bronze and Aluminum Electrical Connectors for Substations, Transmission and Distribution Lines.



TYPE LC-71
Dead-end Clamp; Aluminum to Aluminum Splice or Tap Clamp.

TYPE LC-811
Aluminum over Armor to Copper Tap.



with leather for extra comfort and durability. Saddle is fitted with forged D-rings for sling, and belt is equipped with both a ring and snap-fastener for carrying tools and accessories. Another style can be furnished without leather lining.

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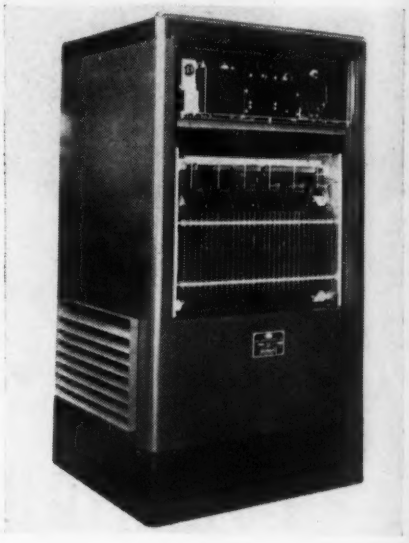
Dust Precipitator Developed for Home Use



A PRECIPITATOR for domestic use is being announced by Raytheon Mfg. Co, Waltham, Mass. It is designed for use with a warm air furnace or an air-conditioning system, and has a capacity of 1,200 cfm. The precipitator has a demand of 50 w.

The unit is essentially a small version of the company's industrial precipitator, tailored to domestic application. It is attached to the air intake of the furnace or to the intake of an air-conditioning system. The air passes through the electrostatic field and then down through the vertical plates which attract the charged dust particles. The plates are periodically cleaned with a valve-controlled water spray.

•

Electrode for Welding Light-Gage Metals

A NEW ELECTRODE, Hobart No. 13, designed to simplify the welding of light gage mild steel, has been announced by Hobart Brothers Co, Troy, Ohio. Low penetration, ease of handling and steady uniform transfer of metal are said to contribute to make this electrode extra fast for out of position welding on light-gage sheet metal. It is also recommended for welding light sections of mild steel to

UNITED STATES RUBBER COMPANY

SERVING THROUGH SCIENCE

America's Finest Aluminum Cables

Neolay

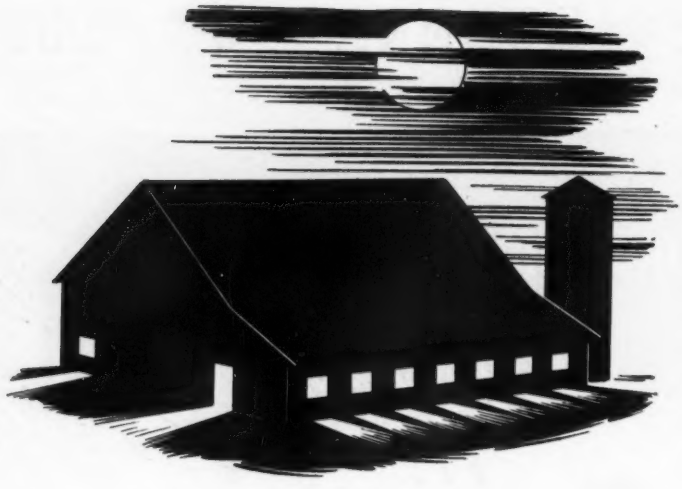
as much as 50% lighter

Neolay—up to 50% lighter than ordinary cables—is extremely easy to install . . . easy on the pocketbook, too. Neoprene cover is tough, abrasion resistant and resistant to oil, fire and cold.

Write for new 32-page brochure describing all types and sizes of "U. S." aluminum wires and cables. Address Wire and Cable Department, United States Rubber Company, 1230 Avenue of the Americas, New York 20, N. Y.

*Neolay** Aluminum Cables.

*®



Just three years from the Derby...

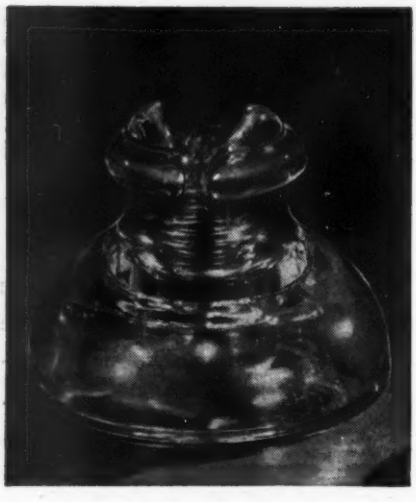
A spider-legged red colt in the stable was bred to be a winner.

It was a hard birth. Help was needed—and that help might well have been impossible in darkness or with only the flickering light of a smoky lantern.

But the veterinary was aided by brilliant electric lighting. The little fellow took his first uncertain step at midnight—in a stable bright as day. He'd fulfill his destiny.

•

Power for lighting this farm is carried on lines using Owens-Illinois Power Insulators. These insulators for rural lines and other medium voltage requirements are made by a pioneer company in the glass insulator field. Every care is taken in manufacturing, testing and inspection to insure dependability and uniform quality.



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Owens-Illinois Insulator No. 514 has been approved by the Technical Standards Committee of the Rural Electrification Administration under the limits of AIEE Specifications No. 41-1944. Designed for 15,000 volt lines.

Principal jobbers carry stocks of this and other Owens-Illinois Power Insulators. Orders are being promptly filled.

OWENS-ILLINOIS POWER INSULATORS

Owens-Illinois Glass Company, Hemingray Division, Muncie, Indiana

heavier ones. The electrode is designed for use with d-c straight polarity or alternating current and is available in $\frac{1}{16}$, $\frac{5}{64}$, $\frac{3}{32}$ and $\frac{1}{8}$-in. diam.

•

Industrial Hand Truck Load Capacity 1,000 Lb

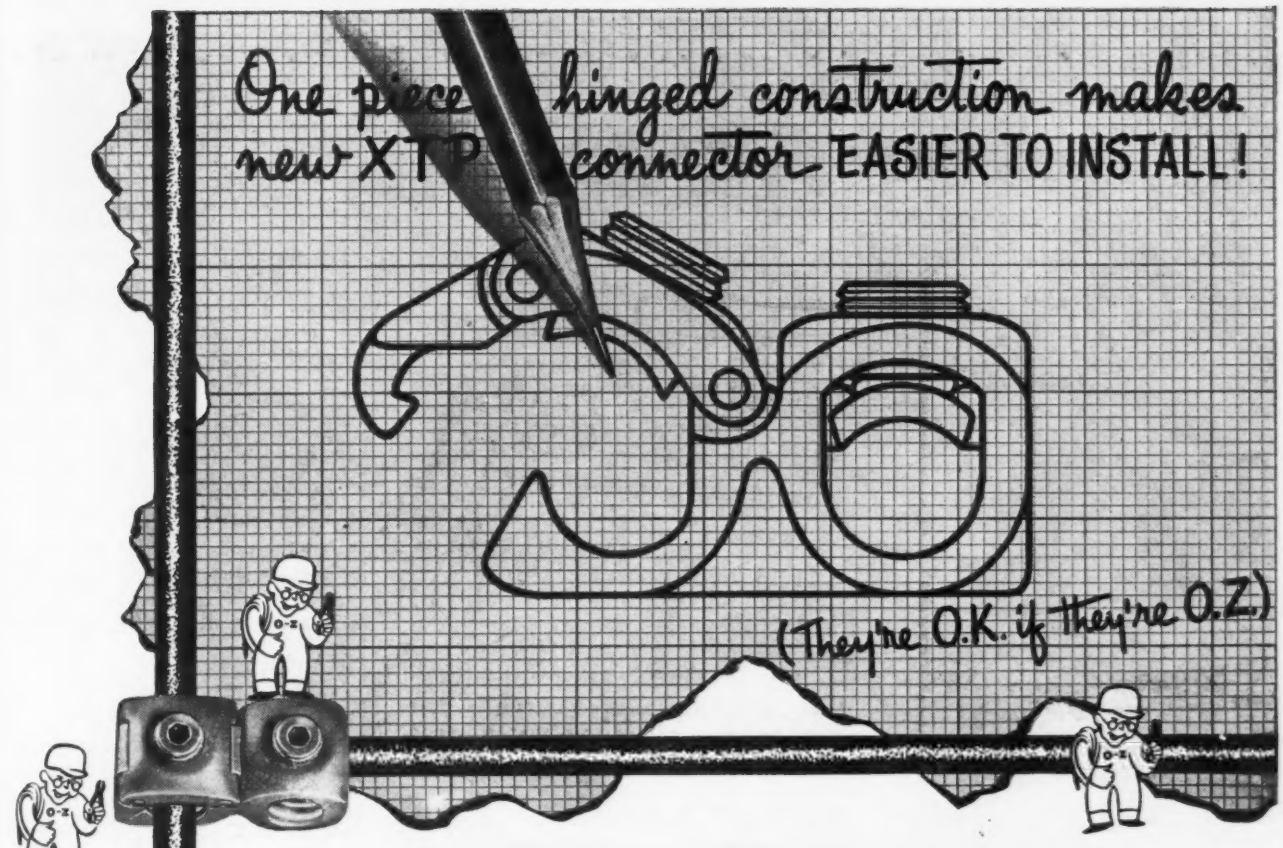
DUAL-MOUNTED solid rubber wheels are a feature of the Model 88R appliance and industrial hand truck made by The Handees Co. Dept 770, Bloomington, Ill. The unit has a load capacity of 1,000 lb and is constructed of tubular steel. Standard equipment includes heavy web strap 12 ft long complete with non-slip buckle and protective tip. A removable nose-piece of $\frac{1}{4}$-in. thick steel plate 24 in. wide provides for easy handling of large appliances, crated items, etc. Truck height of 54 in. is of great advantage in moving of refrigerators, etc. The four 8x2-in. wheels are equipped with prelubricated bearings.

•

Timer Signals Completion of Time Interval

A NEW SIGNALLING timer is designed to command visual and audible attention the instant a time interval is completed. It is a product of Industrial Timer Corp, 110 Edison Place, Newark 5, N. J. This Series S timer is reported to be exceptionally versatile in applications in that it provides for the automatic closing or opening of a circuit at the end of elapsed time, and operates additional buzzers, bells or lights at remote locations.

When the pointer on the timer is manually set to the required interval shown on the dial, a circuit is closed which operates a pilot light indicating that the time interval has started. The moving pointer turns counter-clockwise toward zero. When the interval is completed, an audible alarm sounds and



FOR TEE OR PARALLEL TAPS YOU'LL PREFER THIS O. Z. FITTING FOR ITS COMPACT SIMPLICITY!

Get strong, positive connections – speedily, simply – with this new one-piece XTP connector. Without loose parts to drop, anyone can install XTPs properly. Merely clamp the hinged jaw over the main and tighten – you've made a permanent connection. Whenever desired, tap can be inserted and tightened in any of three directions without disturbing main.

Other reasons why the XTP is more economical:

- **25 CONNECTOR SIZES** do practically all tap jobs
  Fit over 400 combinations of wire sizes, #8 to 1,000,000 CM
- **SPRING STEEL LOCKWASHERS** (tin plated) maintain pressure
- **PRESSURE PLATES** (non-rotating) serrated for maximum grip
- **HIGH CONDUCTIVITY** copper alloy body
- **EXTRA STRENGTH** copper alloy pressure plates and hinged parts

Used for either tee or parallel taps – one typical XTP replaces 32 different connectors, cuts your inventory to a minimum. Get this time-and-money-saving one-piece hinged connector from your wholesaler. Ask for XTP, made by O.Z.

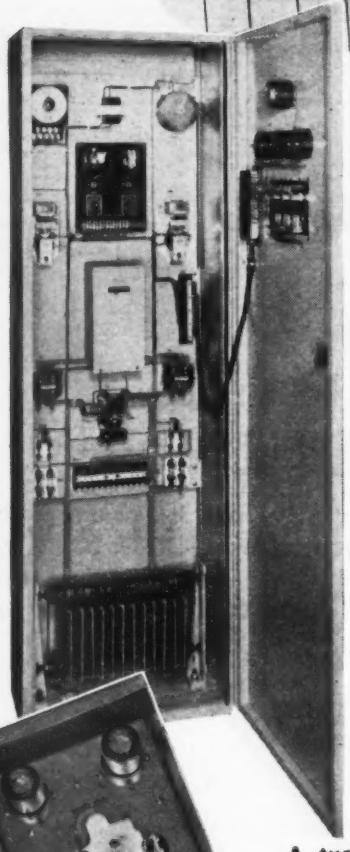
CONDUIT FITTINGS
CABLE TERMINATORS
CAST IRON BOXES
SOLDERLESS CONNECTORS
GROUNDING DEVICES
POWER CONNECTORS

O.Z. ELECTRICAL MANUFACTURING COMPANY
262 BOND STREET · BROOKLYN 2, N. Y.

Boost your load factor
Increase your revenue
Improve customer service
Use

THE IMPROVED METHOD OF PEAK LOAD CONTROL

PEAK-TROL



Now you can add more off-peak loads! Peak-Trol operates on an entirely new principle. You are unhampered by any predetermined time schedule. Peak-Trol drops off-peak loads when peaks come . . . picks up off-peak loads (automatically or manually) when peaks pass.

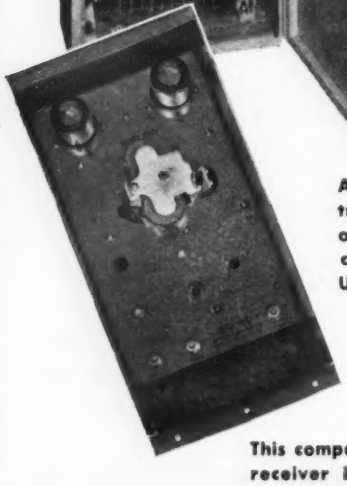
Peak-Trol is ideal for controlling:

- Water Heaters
- Street Lighting
- Residential Heating
- Deep Freezers
- Milk Plant Cooling
- Certain Industrial Loads

Now you can add more of these loads and boost your load factor, without increasing installed capacity. At the same time, you can increase your revenue.

Peak-Trol operates any time, day or night. This gives maximum use of water heaters with safety to the power system and results in increased customer satisfaction.

WRITE for new bulletin just released!



A typical Peak-Trol transmitter. Automatic or manually controlled as desired. Compact. Uses very low wattage.

This compact Peak-Trol receiver is located at each off-peak load site. Only one moving part. Built for long, trouble-free service.

NEW 8 PAGE PEAK-TROL BULLETIN
No. TA-1 tells about the new principle of operation. Shows a typical application to a power system. Write for your free copy today!

CONTROL CORPORATION
719 CENTRAL AVE. • MINNEAPOLIS 14, MINN.

the pilot light goes out. The buzzer continues to sound until the toggle switch on the timer is snapped to off position or the timing interval is again started, by moving the pointer knob to the required time interval.

Sockets are provided on side of case for both normally open or normally closed circuit control and also for connection of additional lights or alarms.

The timer is inclosed in a metallic grey case, attachable to any wall or panel or standard switch box. It is 5 x 5 x 3½ in. deep and operates on a-c circuits, 115 or 230 v; 25, 50 or 60 cycles. Motor is slow speed, self-starting synchronous type.

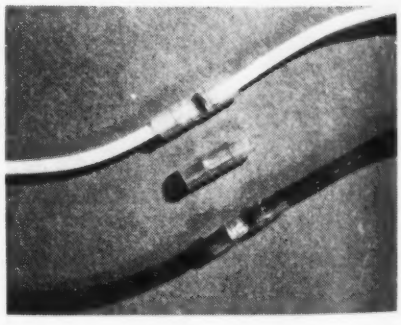
•

Eccentricity Gage Tests Coating on Welding Rods

AN ELECTRONIC ECCENTRICITY GAGE for testing welding rods during the extruding process before or after baking has been developed by Moslo Machinery Co, 2443 Prospect Ave, Cleveland 15, Ohio. The gage uses a balanced circuit in which one rod is for balancing, the other for measurement. Rods for testing are placed in V-blocks, rotated, and measured by a pick-up device. Eccentricity is shown in 0.001 per inch increments. The instrument can be furnished for 115-v, 60-cycle circuits, or other voltages.

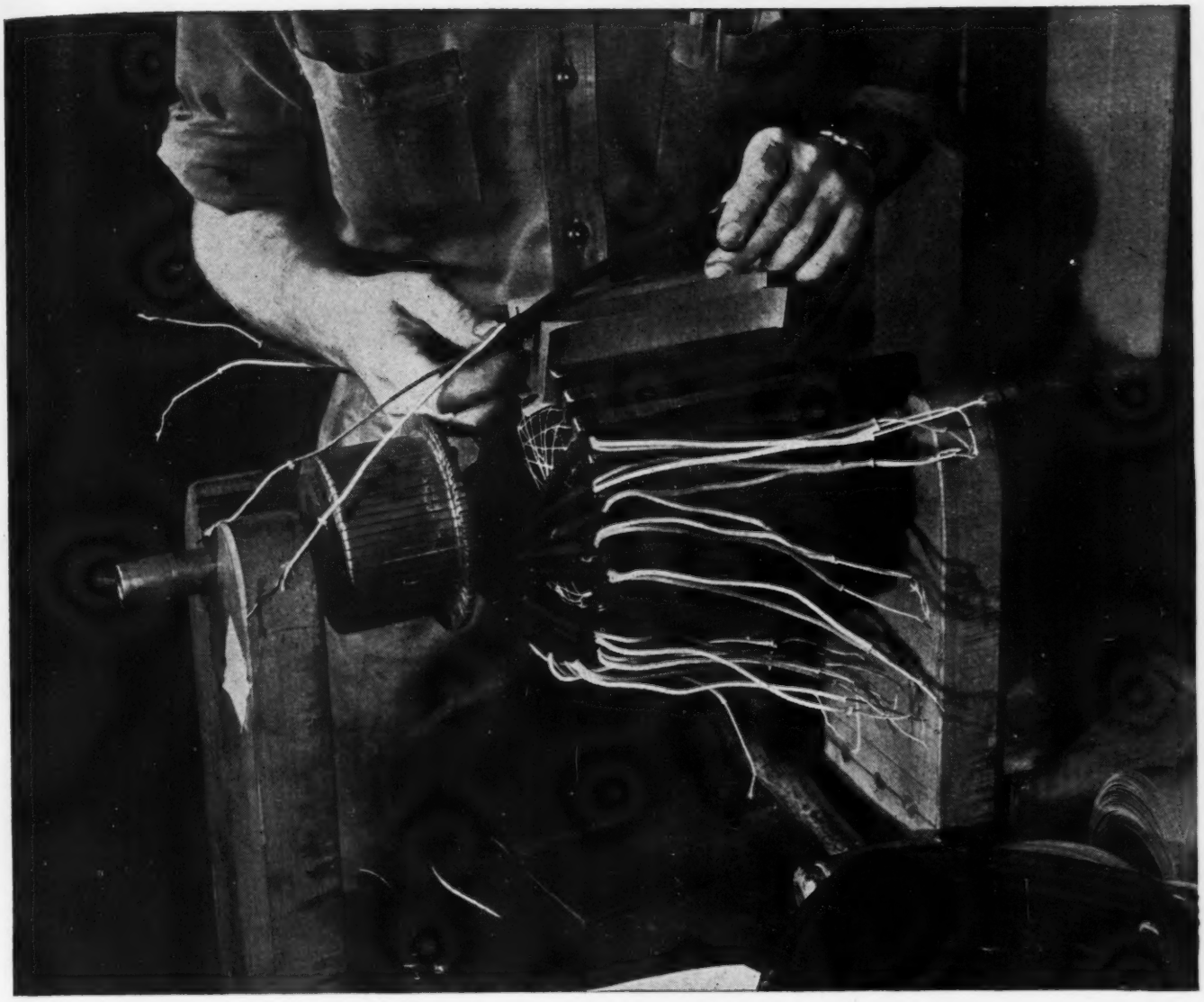
•

Bronze Connector Has Translucent Insulator



LATEST ADDITION to the line of Sta-Kon pressure connectors is the No. 25 insulated splice, according to an announcement by Thomas & Betts Co, Elizabeth 1, N. J. It is a seamless bronze connector protected with a translucent high dielectric plastic insulator reported to be impervious to oil, grease, water, chemicals and acids.

A single squeeze of an installing tool is said to connect permanently both wires and insulate the connection. The connector is available in the following wire sizes: No. 14 to No. 20, single or in combination.



How Fiberglas* helps reduce motor maintenance costs

Fiberglas-base Insulating Materials have high resistance to moisture, corrosive acids and vapors and the effects of overloads. Fiberglas withstands heat far beyond the temperature range of even the newer insulating varnishes. Therefore, should the impregnants burn out, the Fiberglas base still provides protection as a permanent spacer.

As proof of its extra protection *and economy*, a recent survey shows that, on the average, industrial motors rewound with Fiberglas *lasted six times longer* than when insulated with organic-base materials. The cost of Fiberglas materials required was 67% less than that of the Class "A" materials that would be needed to give the same length of service.

Fiberglas Electrical Insulating Materials are made in forms to meet practically every insulation need. Ask your supplier for complete information or write: Owens-Corning Fiberglas Corporation, Dept. 858, Toledo 1, Ohio. Branches in principal cities.

In Canada: Fiberglas Canada Ltd., Toronto, Ontario.

*FIBERGLAS is the trade mark (Reg. U. S. Pat. Off.) of a variety of products made of or with glass fibers by Owens-Corning Fiberglas Corporation.

OWENS-CORNING
FIBERGLAS
Reg. U.S. Pat. Off.

ELECTRICAL INSULATING MATERIALS

TAPES • CLOTHS • BRAIDED SLEEVING • VARNISHED TUBING • MAGNET WIRE • MICA COMBINATIONS • LAMINATES

NEWS ABOUT PEOPLE

Thorn Succeeds Rogers as Birmingham President

Charles S. Thorn, vice-president and general manager of the Birmingham Electric Co, has been elected president of the company. His predecessor, William M. Rogers, resigned but will continue as chairman of the board.

Thorn is an electrical engineering

C. S. THORN

graduate of Rensselaer Polytechnic Institute, class of 1913. Before going to Birmingham Electric in 1927, he was associated with the Philadelphia Electric Co and Florida Power & Light Co.

His first position with Birmingham was in the engineering department. He has been progressively promoted to chief engineer, asistant to the president, and vice-president and general manager.

•

▶ THOMAS B. BLACK has been appointed general manager of the Northern British Columbia Power Co, Prince Rupert, B. C. He succeeds the late J. J. Little. Mr. Black has been operating superintendent of the Northern British Columbia utility since 1938.

▶ R. E. THOMPSON of Rochester, Ind., who has been connected with the Rural Electrification Administration for the past 9 years, has been named manager of the Carroll County REMC at Delphi, Ind. He succeeds Clarence Darragh, resigned.

N. C. STIREWALT

N. C. Stirewalt Advanced to Utility Vice-Presidency

Newman C. Stirewalt, purchasing and stores agent of the Central Illinois Public Service Co, Springfield, has been elected a vice-president.

He has been an employee of the utility since his discharge from the army in 1919. His first position was as fuel clerk. Becoming assistant purchasing agent in 1927, Stirewalt was advanced to the position of purchasing and stores agent in April, 1929.

He was born October 20, 1894, near Greenup, Ill., where he supplemented his high school education with a post graduate study on business administration.

•

▶ CALVIN V. DAVIS, former principal planning engineer for TVA, has been assigned to go to Argentina as advisor to the Peron Government on its five-year program of hydroelectric development. He will be in charge of designing two Argentina dams to cost more than $30.000,000 each. Davis recently resigned as southern manager at Knoxville for the Frederick R. Harris Engineering Corp. He was succeeded by Admiral H. E. Kimmel.

▶ DON THOMPSON has assumed his duties as manager of the Douglas County PUD at Bridgeport, Washington. He formerly was with the Pacific Power & Light Co at Portland.

General Superintendent's Post Goes to W. J. Geary

W. J. D. Geary has been made general superintendent of the Pennsylvania Power & Light Co. His predecessor, M. F. M. Werth, has retired after 24 years of service.

Geary, who has been superintendent of operation for the company at Hazleton, will continue to make his headquarters there. He joined a predecessor company of PP&L in 1912 as a meter tester and has since held positions as foreman of the meter testing department, test engineer, and general foreman. In 1923 he was appointed Lehigh Division superintendent in Allentown, in 1930 superintendent of transmission, and in 1939 superintendent of operation at Hazleton.

Werth has had a long career in the electrical industry. Between his graduation from Virginia Military Institute in 1902 as an electrical engineer and his joining PP&L in 1923, he worked

W. J. D. GEARY

for numerous companies. Included among them were Chesapeake & Ohio RR, General Electric Co, Witherbee Igniter Co, Mahoning-Shenango Railway & Light Co, British Columbia Electric Co, Detroit United Railway, and Sanderson & Porter. At PP&L he has successively held the positions of superintendent of generation, superintendent of operation, and general superintendent.

Other changes in the utility organization are the following appointments:

ANTICIPATING THE NEED...

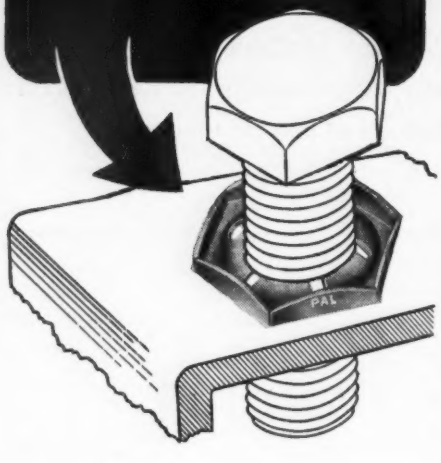
Our current work for Public Utilities includes design and construction of 23 power stations and power plant extensions and 220 miles of transmission lines. These installations will make available 1,673,000 KW of additional power to supply the needs of fast growing industrial and farming areas.

Mississippi River Crossing Tower and Louisiana Power Station of the Gulf States Utilities Company in Baton Rouge.

STONE & WEBSTER ENGINEERING CORPORATION

A SUBSIDIARY OF STONE & WEBSTER, INC.

Use
PALNUTS
to lock
Adjusting Screws
on Relays and
Circuit Breakers



Hold Accurate Settings under Severest Vibration

An adjusting screw that won't "stay put", is soon valueless. To maintain accurate settings of adjusting screws, lock them with "Palnut" self-locking nuts instead of regular hex nuts or jam nuts. This provides a powerful double-locking action that is unmoved by severe, prolonged vibration.

Single thread, tempered spring steel "Palnuts" require only 3 bolt threads space. They spin on fast with fingers, lock tight with a wrench. Cost no more, and frequently less, than regular nuts. May be re-used. Full line of sizes in National Coarse and National Final Threads.

WRITE for literature giving data on Self-locking "Palnuts." Outline requirements for samples.

THE PALNUT COMPANY
51 Cordier St.
Irvington 11,
New Jersey

SELF-LOCKING
PALNUTS

J. A. Snyder, assistant general superintendent; C. E. Lewis, superintendent of generation; C. H. Frick, manager, coal bureau; and R. L. Hallman, plant betterment engineer.

•

R. V. Pfautsch Named Chief Engineer of ILG Electric

Raymond V. Pfautsch has been named chief engineer of the ILG Electric Ventilating Co, Chicago. He succeeds A. G. Sutcliffe, who retired on

R. V. Pfautsch

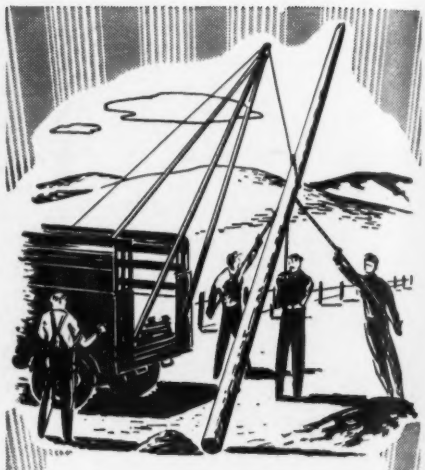
July 1 after serving 37 years with the company, the past 20 as chief engineer.

Pfautsch graduated from the University of Illinois in 1929 with a degree in mechanical engineering. He immediately entered ILG's employ as a member of the Engineering Department, specializing in new product development. In 1940 he became assistant chief engineer, a post he held until his recent promotion.

•

▶ George A. Drewett has been appointed superintendent of construction for the Pacific Power & Light Co, with headquarters at Portland. He has been serving as division engineer at Vancouver, Wash. In his new capacity he will supervise construction and maintenance on power transmission facilities for the Pacific system. He succeeds R. E. Forman, who has been appointed to a new post as superintendent of distribution. A. O. Mangold becomes division engineer, replacing Drewett.

▶ Albert T. Bergeron, sales manager of the illuminating division of The Miller Co, Meriden, Conn., has been appointed manager of this division. He will continue to direct lighting sales. Mr. Bergeron has been associated with the company for 22 years. He previously served as district sales manager



Better
POLE PROTECTION
by Every Standard

Today, alert buyers in increasing numbers specify Chapman "Penta" Preservative treatment for wooden line materials. That's because this modern wood preservative has proved so satisfactory on *all* counts.

"Penta" Preservative, by actual test, provides unsurpassed protection against rot and insect damage.

Wood treated with "Penta" Preservative is practically odorless and clean to handle. That makes it favored by installation and maintenance crews.

Finally, regular treating plant methods and equipment are used to apply "Penta" Preservative. Most progressive plants use it now — all can get it for you quickly.

The complete, interesting story on Chapman "Penta" Preservative is yours for the asking. Write for details today.

CHAPMAN

CHAPMAN CHEMICAL COMPANY
Suite 542
333 N. Michigan Ave., Chicago 1, Ill.

"Penta" Preservative contains *Pentachlorphenol*, a product of *The Dow Chemical Company*

Runner for 35,000-hp. capacity Pelton (impulse) type turbine for Southern California Edison Company, head 2200 feet.

FROM THE LARGEST to the smallest

Baldwin offers:

97 years' experience in the design and manufacture of hydraulic turbines.

The complete turbine line includes a type and size to satisfy any head condition and any output requirement.

May we tell you how our experience and facilities can help you?

BALDWIN hydraulic turbines

for every type of power development

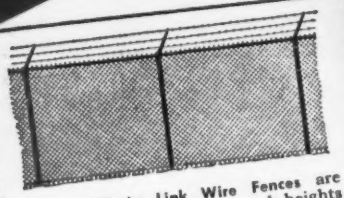
BLW THE BALDWIN GROUP

BALDWIN

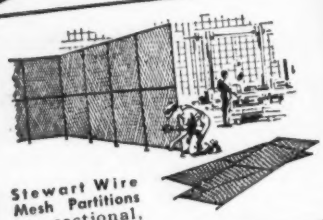
The Baldwin Locomotive Works, Philadelphia 42, Pa., U. S. A. Offices: Philadelphia, New York, Boston, Birmingham, Houston, St. Louis, Chicago, Cleveland, Detroit, San Francisco, Seattle, Washington, Pittsburgh.

STEWART FENCES
AND
METAL SPECIALTIES

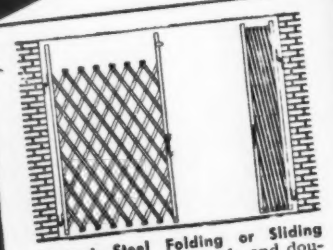
Stewart Wire and Iron Products include many items which are used extensively in the electrical field. Three are illustrated. Others are Iron Picket Fences and Gates; Wire and Iron Window Guards; Machinery Guards; Pipe Railings; All Steel Settees, etc.



Stewart Chain Link Wire Fences are made in several weights and heights to meet all requirements. Style 3TH is shown above. Also made in style 5TH (5 strands of barbed wire) and 0TH, without barbed wire overhang.



Stewart Wire Mesh Partitions are sectional, and made to fit any space. Give all measurements when writing for information.



Stewart Steel Folding or Sliding Gates are made in single and double construction to fit any opening.

Literature sent on request. When writing please mention products in which you are especially interested.

The Stewart Iron Works Co., Inc.
1466 Stewart Block Cincinnati 1, Ohio
Experts in Metal Fabrications Since 1886

Stewart IRON and WIRE FENCES

of the West Coast territory and was appointed to the position of sales manager last summer.

•

Balcom of Sylvania Heads Radio Makers Association

Max F. Balcom, vice-president and treasurer of Sylvania Electric Products, Inc, has been elected president of the Radio Manufacturers Association. He

M. F. BALCOM

has been active in the association for the past twelve years, serving as vice-president for two separate terms and as a board member for the past five years.

During the war and reconversion periods, he represented the association in joint effort with government agencies to expedite tube production. Among other official RMA posts, he has held the chairmanship of the OPA Radio Tube Manufacturers Industry Advisory Committee and the chairmanship of the RMA Surplus Disposal Committee.

His association with the electric industry began in 1918 when he joined the staff of Novelty Incandescent Lamp Co, predecessor of Sylvania Electric, as purchasing agent. In 1924 when the Sylvania division was organized to manufacture radio receiving tubes, he became a director of the division. In 1931 he became assistant secretary of the combined lamp and tube divisions.

From 1937 until his election as treasurer in 1944, Balcom was vice-president in charge of the radio tube division.

•

▶ ORRIN S. VOGEL, engineering and technical adviser to the Georgia Public Service Commission for the past ten years, has joined Florida Power Corp. as assistant to the vice-president in charge of rate and cost analysis. Vogel is a graduate electrical engineer of Rensselaer Polytechnic Institute and did post graduate work at Georgia Tech. Before going with the Geor-

FOR
STRENGTH
AND
DURABILITY!
Silicon
BRONZE
BOLTS

Extra strength . . . resistance to corrosion . . . resistance to season cracking . . . these are some of the qualities of Harper Silicon bronze fastenings which have led to their use by scores of power companies and electrical equipment manufacturers. These fastenings go into sub station assemblies, pot heads, pole line hardware, grounding equipment, and a host of other applications.

5200 ITEMS IN STOCK

Harper maintains a large and widely assorted stock of Silicon bronze bolts, nuts, screws, washers, and rivets. Moreover, similar stocks are maintained in brass, naval bronze, copper, Monel and stainless steel. Ask for summarized catalog.

ASK HARPER ENGINEERS

Harper engineers specialize in the manufacture and use of non-ferrous and stainless fastenings. Submit your fastening problems to them.

The H. M. HARPER COMPANY
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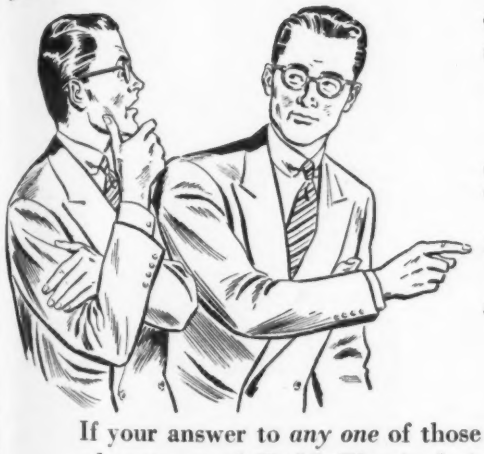
HARPER *Chicago*

EVERLASTING FASTENINGS

Ask yourself these 4 questions about the mounting materials in your plant

Panels, switchboards and other electrical apparatus mountings are key factors of an electrical power system. Are yours sufficiently up-to-the-minute to meet present-day needs? To find out, ask yourself these four questions:



1. **Are they proof against moisture and oil absorption?**
2. **Can they stand frequent high-voltage surges?**
3. **Will they withstand vibration, or temperature changes?**
4. **Are they in perfect condition — without cracks and unwarped?**

If your answer to *any one* of those questions is "no", it's time to investigate the advantages of K&M Ebonized Asbestos . . . for Ebonized Asbestos is a high-dielectric panelling material that gives a positive "yes" to each of those queries. A tough, all enduring combination of asbestos, cement and an insulating compound, Ebonized Asbestos is ideal for modern electrical work, according to fabricators who work it, and plants that use it. When built into assembled units, it meets the technical requirements of Underwriters' Laboratories, Inc. Write us for full particulars about Ebonized Asbestos.

Reg. U. S. Pat. Off.

Nature Made Asbestos . . .

Keasbey & Mattison has been making it serve mankind since 1873

KEASBEY & MATTISON

COMPANY • AMBLER • PENNSYLVANIA

IN CANADA—ATLAS ASBESTOS CO., LTD. • MONTREAL, TORONTO, WINNIPEG and VANCOUVER

Give your crews the

Protection

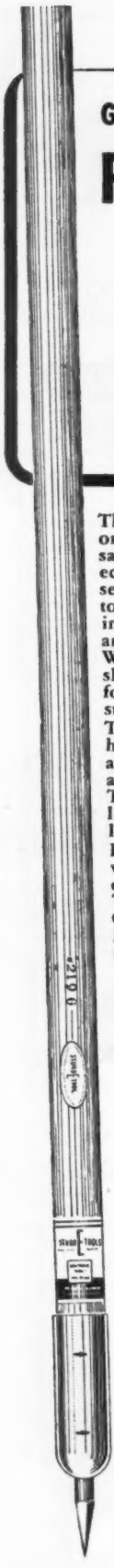
of this

STURDE Guarded Pike Pole

The patented, automatic shield on this SturdE pike pole is a safety feature for your men—an economy feature for you. The seamless steel tube slides down to protect the point when not in use, guards it against damage and prevents accidents to crews. When action starts, the guard slides back, and *locks* to reinforce the ferrule and give added strength.

The 8⅛ in. spike is forged from high grade steel, heat treated and tempered for hard service, and can be easily repointed. The fir handles are sanded and lacquered, and come in five lengths, 12 to 20 feet.

Here's a sturdy, long-life tool with a safety feature that adds extra value. Manufactured by The American Fork and Hoe Company, Cleveland, Ohio, Makers of True Temper Products.



STURDETOOLS
a TRUE TEMPER PRODUCT

Exclusive SturdE feature — Automatically released tubular shield is easy to operate, locks into place and reinforces head when pole is in use. Slips down to protect point for carrying and storing.

Distributed by
JOSLYN MFG. & SUPPLY COMPANY
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Branches and Warehouses with Complete Stocks in Principal Cities of the United States

gia commission he was valuation, planning, and cost engineer for the Georgia Power Co. He is a former executive chairman of the National Conference of Public Service Commission Engineers.

•

Changes in Personnel Follow Northwest Merger

Reorganization changes in personnel as a result of the merger of the Pacific Power & Light Co and Northwestern Electric Co include the appointment of E. F. Pearson to the position of assistant general manager of the northwestern division of Pacific Power & Light, in charge of the company's operations in Portland and Rainer, Ore., and Vancouver and Camas, Wash.

Other new assignments, announced by George T. Bragg, vice-president and general manager of the enlarged Pacific organization, include:

Cecil A. Root, member of Northwestern's Vancouver staff since 1934, promoted to Vaucouver district manager.

J. C. Plankinton, head of Northwestern's commercial department, named assistant to the vice-president in the rates and research department.

D. B. Leonard, acting assistant general manager, appointed sales manager for the merged operation, with headquarters in Portland.

Succeeding him will be T. M. Keeman, acting commercial manager.

H. H. Schoolfield, formerly Pacific's general superintendent, named chief engineer of the combined companies.

O. L. LeFever, head of Northwestern's engineering section, made assistant chief engineer of Pacific.

D. R. McClung, assistant superintendent, becomes Pacific's general superintendent and Tom Perry becomes superintendent of the Northwestern division.

Other appointments: S. E. Skelley, personnel supervisor; A. W. Angell, supervisor of transportation; R. L. Stout, right-of-way engineer, and H. W. Millay, administrative assistant in the office of the president.

•

▶ RALPH C. CROUSE has been named chief of the Maintenance Division, Plant and Structures Branch, for the Sixth Region of the Civil Aeronautics Administration. A graduate in electrical engineering from Iowa State College, Crouse started to work for CAA in 1941 as superintendent of construction and engineering-in-charge of all types of air navigation facilities, including landing area and airport lighting systems, radio ranges and communication facilities. Before his employment with

SUPERIOR

SINCE 1923

The name SUPERIOR has stood for top quality meter testing and installation equipment — built specially for the

UTILITY INDUSTRY

SUPERIOR SWITCHBOARD & DEVICES CO.
CANTON 1, OHIO
A subsidiary of The Union Metal Manufacturing Co.

CAA, he worked for three years with the Wickes Engineering Co, and for 20 years before that operated a private engineering and construction business, specializing in the electrical and mechanical fields.

•

Virginia Electric Makes New District Assignments

Announcement has been made by the Virginia Electric & Power Co of the following district appointments:

W. O. Scott, formerly assistant to the district manager, Norfolk district, has been appointed district superintendent, Rappahannock district.

R. K. Carver, formerly assistant district superintendent, Rappahannock district, has been appointed superintendent of lines and stations, Rappahannock district.

E. B. Hurst, formerly distribution engineer in Portsmouth, Norfolk district, has been appointed assistant to the district manager, Norfolk district.

M. L. Simpson, formerly junior engineer, Norfolk engineering department, has been appointed distribution engineer at Portsmouth, Norfolk district, and E. A. Darden, formerly junior engineer, Norfolk engineering department, has been appointed distribution engineer at Virginia Beach, Norfolk district.

S. V. Tallman, formerly manager at Crewe, has been appointed manager at South Boston, Southside district and R. F. Lynch, formerly plant records representative for the Southside district, has been appointed acting manager at Crewe, Southside district.

F. L. Gibbs, formerly sales engineer, Richmond district sales department, has been appointed manager at Ronceverte, W. Va., Alleghany district.

Oscar W. Adams, formerly sales manager, Peninsula district, has been appointed sales supervisor, Alleghany district, residing in Clifton Forge.

•

▶Fred B. Wilson, assistant to the president of Georgia Power Co, will retire September 1 in order to devote more time to his other business interests which include the Henry Grady Hotel, which he owns in partnership with Cecil Cannon and radio station WFOM at Marietta. Wilson joined the company in 1932 as assistant to the late Preston S. Arkwright.

▶Bert Thompson, assistant to the sales manager of the Central Division of the Puget Sound Power & Light Co at Seattle, has retired after 52 years with the company. He started with the old Seattle Electric Co, later trans-

BLACKBURN Service Entrance CONNECTORS

IT COSTS LESS TO USE BLACKBURN!

BLACKBURN Service Entrance Connectors cost no more originally. In the long run—year after year—they actually cost *less*, because they *last longer* and give better service. That's due to their high-strength construction of DURONZE, which is over 50% stronger than hard copper or commercial bronze commonly used in the trade. Also, their circular construction gives them extra strength along the line of pull of the screw. Cut maintenance costs, with BLACKBURN Connectors!

Over 100 Conveniently-Located Jobbers' Stocks

BUILDERS OF QUALITY CONNECTORS FOR OVER 10 YEARS
JASPER BLACKBURN PRODUCTS CORP.
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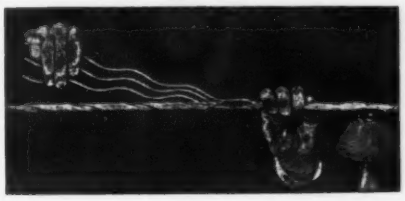
REINFORCE YOUR CONDUCTORS *and* DAMPEN VIBRATIONS *with*



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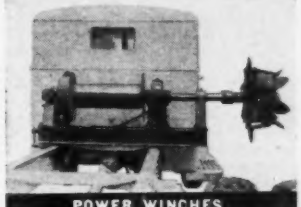
FOR PUBLIC UTILITIES
OUR 29TH YEAR—1918-1947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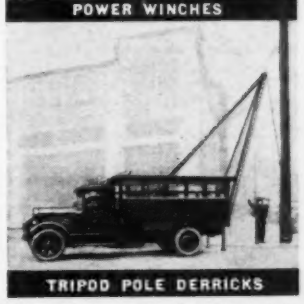
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WINCHES: Capstans; Single and Double Drum, Jaw Clutch, Keyed and Friction Clutch Winches, 2,000 to 50,000 lb. Cap.
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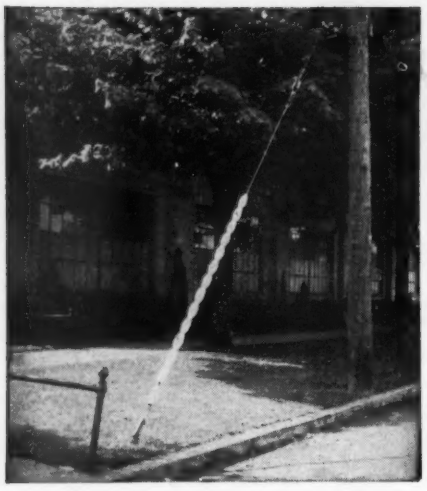

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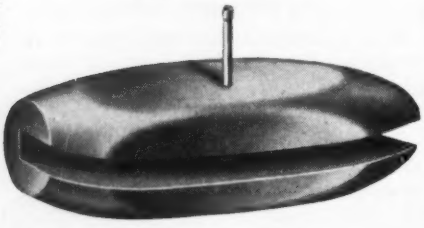

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Literally a string of pillows, the Overton-Flexibal Guy Guard cushions the shock. It is the only guard that *gives* with the guy. No other type is so easy to handle, so simple to install. None other is so effective in cutting down losses. Nothing ever puts it out of commission. And they cost less! Separate spindles, smoothly shaped, are made of hard wood and aluminum-painted for greatest visibility and long life. Adjustable to any length in 6-inch steps. 5-6-7-8 foot lengths boxed for immediate shipment, — no waiting. Modernize your guy wire guards now, — you'll never go back to the old rigid style once you try Overton-Flexibal. Field-tested for years in thousands of locations.

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ferred to the Puget Sound Traction Co, then joined the sales department of Puget Sound.

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OBITUARY

Henry H. Higbie

Henry H. Higbie, 64, professor of electrical engineering, University of Michigan, died August 3 in a hospital at Ann Arbor. He held his professorship at the university since 1913 and was a faculty member since 1905. From 1911 to 1913, he was on leave as head of the Department of Electrical Construction and Operation at the Wentworth Institute, Boston.

He received his electrical engineering degree from Columbia University in 1905. Through his long life as a teacher he was active in educational and professional society work. He was president of Tau Beta Pi, 1913-1916, and of the Illuminating Engineering Society, 1926-27. He held offices and headed committees in many other societies. He was a fellow of the American Institute of Electrical Engineers and was a member for life.

Professor Higbie did considerable writing especially in the field of lighting and was the author of several books. He held patents on a number of pieces of lighting equipment.

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► LESTER O. STEARNS, 53, Residential Division sales manager of York-Shipley, Inc, York, Pa., died August 1 of a heart attack while at work. He had been in the employ of the company since April. Previously, he had operated his own business, Stearns Supply Co, Cleveland. At one time he was vice-president and a director of Columbia Radiator Co.

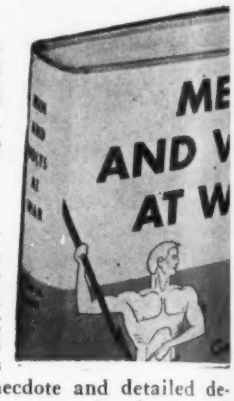
► JOHN L. FOLEY, 47, air conditioning engineer for Westinghouse Electric Corp, Cleveland, died August 4. Before joining Westinghouse in 1938, he was sales manager in charge of wholesaler and dealer business for Avery Engineering Co and prior to that he was a branch manager for the Carrier Corp.

► W. B. DOUGLASS, chairman of the Florida State Railroad and Public Utilities Commission, died of a heart attack August 4 while driving his automobile on the highway seven miles north of Crawfordville. He would have been 62 years old on August 7. Douglass had been a member of the railroad board for 15 years and was serving his third term as chairman.

The stirring story of ELECTRICITY in World War II...

From blueprint to battle line....

How ships, tanks, aircraft, guns and men were outfitted for modern electrical warfare—*and how they served*



Here is the dramatic and human story of *electricity* —at the battlefront and on the fighting ship — in World War II. It brings to life, through anecdote and detailed description, and in almost two-hundred excellent photographs, the enormous contribution of electricity to our wartime fighting equipment. It shows you how the General Electric Company helped to develop hundreds of electrical devices—and traces them directly to the battlefronts in which they served. All of the ways in which electricity aided ships, submarines, landing craft, aircraft, weapons, etc.—are described in absorbing and dramatic detail.

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By JOHN ANDERSON MILLER

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This book tells one of the most fascinating stories of the war—the battle for weapons and equipment on the home front, and how the country's largest electrical manufacturing company met the challenge for one production "miracle" after another. You'll read how new weapons were designed, developed and rushed to the fighting lines; how "ship-to-shore" installations, radio and gunfire were put to greater use. New army weapons, equipment and materials —radar and radar countermeasures—atomic research and engineering—are described in exacting detail.

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12. Radar—The Magic Eye
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Safford K. Colby

Safford K. Colby, 74, vice-president in charge of research and advertising for the Aluminum Co of America, died of a heart attack, August 4, in Pittsburgh. He spent nearly 52 years of his life in the aluminum industry.

A civil engineering graduate of Rensselaer Polytechnic Institute, Colby joined the Pittsburgh Reduction Co (which became the Aluminum Co of America in 1907) as assistant manager of its New York office in 1895. He became manager of this office and in 1905 was sent West in charge of the company's Pacific Coast representatives.

He returned to the East in 1913 and became assistant general sales manager in 1915. In 1920, he was elected president of the American Magnesium Corp and in 1925, president of the American Body Co, then an Alcoa subsidiary. In 1928, he went to Alcoa's general offices in Pittsburgh to take charge of the sales promotion and advertising divisions. He became vice-president in 1931, and the supervision of the Aluminum Research Laboratories was added to his duties in 1937.

•

▶ WILLIAM BRISTOW BINGHAM, 72, for 32 years a staff engineer with the General Electric Co at the Schenectady Works, until his retirement in 1930, died recently at Penfield, N. Y., after a short illness. He was born in Willimantic, Conn., and was graduated in electrical engineering from the Worcester Polytechnic Institute in 1898. Practically his entire career was in the D-C Engineering department of GE where he specialized in electric motor designing.

▶ LLEWELLYN H. HEINKE, 67, who was secretary and vice-president of the United Light & Railways Co before his retirement in 1941, died August 1 in Holland, Mich.

▶ HOWARD H. BEATTY, assistant to the head of the fabricating division, Aluminum Co of America, died August 4 at New Kensington, Pa. He joined the company 30 years ago.

▶ HARRY D. BALLARD, 49, industrial sales engineer for Ebasco Services, Inc, died August 6 at his home in Bronxville, N. Y., following a heart attack. He had just been given a leave of absence by Ebasco to go to Japan on a government survey. He was an electrical engineering graduate of Mississippi Agricultural and Mechanical College.

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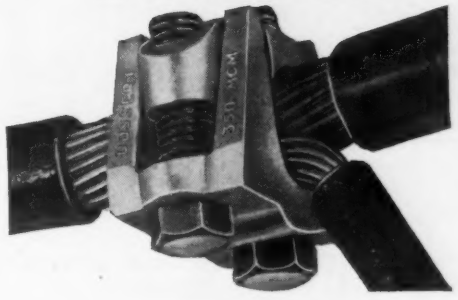

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A one piece bolt type variable service tap. For large size copper cables. Available in sizes from 2/0 to 1000 MCM. Made of high strength copper alloy and equipped with Duronze bolts.

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To be sure of a genuine "Dossert" make sure the name "Dossert" is on your connector.

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NC

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MANUFACTURERS OF NATIONAL COMMUNICATION EQUIPMENT

MANUFACTURERS & MARKETS

General Electric Streamlines Marketing Organization of Appliance Department

General Electric Co's Appliance and Merchandise Department has streamlined its marketing organization to serve better an expanding market and to keep pace with expanding production.

In making this announcement, H. L. Andrews, vice-president and general manager of the department, said that all the department's marketing activities will be coordinated under a manager of marketing. This position will be held by C. R. Pritchard, whose former position as general sales manager of the department has been discontinued.

In his new position, Pritchard will be responsible not only for all direct sales activities, but also for consumer, market and distribution research, advertising and promotion, product planning and appearance design, production schedules and product service. In addition, he continues as a member of the department's advance engineering committee.

The major and traffic appliances sales divisions have been merged. The construction materials sales division has been retained.

A. M. Sweeney, who was manager of major appliance sales, has been made manager of all appliance sales. He will be responsible also for the district organization, field contacts, meetings, and exhibits. His assistant will be C. W. Theleen, formerly manager of traffic appliance sales.

J. H. Crawford continues as manager of construction materials sales.

Twenty-two factories are now turning out appliances and construction materials for General Electric. Nine of these have been acquired since the war. Most of the others have been remodeled or enlarged.

CHECKING THE PLANS—Dr. K. B. McEachron, left, assistant Works engineer of the Pittsfield Apparatus Works, and J. H. Hagenguth, engineer of the new high-voltage laboratory, check plans for General Electric's new lightning center at Pittsfield. The new building will house two 5,000-kv impulse generators and a 1,000-kv, 3-phase, 60-cycle transformer bank. The 60-cycle equipment will permit single-phase, 60-cycle voltages up to 1,750 kv

Bank Extends Appliance Exhibits to Many Branches

Manufacturers Trust Co. plans to extend appliance exhibits now running at seven of its branches to between 25 and 30 branches, William E. Gleason, consumer credit department manager, has stated. He pointed out that the operation, under which dealers are permitted to display and take orders on refrigerators, television sets and many other appliances but not to solicit business, has worked out satisfactorily.

He said that the institution began the program to stimulate bank-financed appliance time purchases and also to provide effective services to depositors who are also appliance dealers.

•

Forms Latin-American Unit

Announcement has been made by the Automatic Sprinkler Co of America of the formation of a new affiliate, Automatic Sprinklers do Brasil S/A, Sao Paulo, Brazil, for the purpose of promoting throughout South America, the advantages of safety and fire protection. The company's authorized capital, which has been fully subscribed, is in the amount of $2,000,000 (Cruzeiro). Plans for a modern factory, to be located in Sao Paulo, are nearing completion. The Automatic representative and recently elected president of the company, Clyde M. Wood, has been in Brazil since 1945. Associated with Mr Wood is Vice-President Sebastiao de Almeida Ribeiro, prominent in Brazilian industry.

•

More Hot Water

Records of the Virginia Electric & Power Co show that during June, 894 off-peak electric storage water heaters were installed. Such a total was formerly considered a good year's business.

Plate Glass Company Lets 4 Electrical Contracts

Electrical installations, totaling $445,000, have recently been completed or are under contract at three Pittsburgh Plate Glass Co plants by Allegheny Industrial Electrical Co, Pittsburgh, Pa.

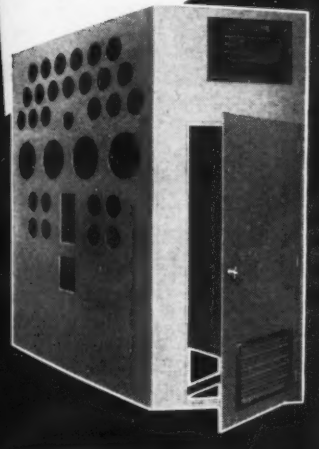
At the Creighton, Pa., Twindow plant lighting and power systems will be installed under a $125,000 contract recently awarded by The Austin Co.

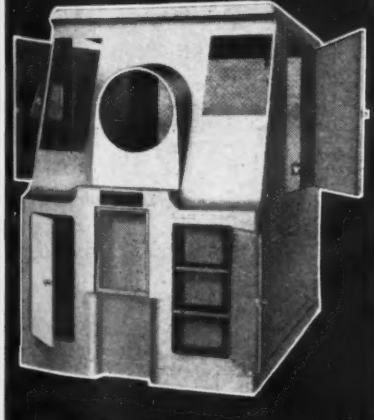
Nearly completed is the electrical installation at a new paint plant at Springdale, Pa., under a $150,000 contract.

Expansion and modernization of the wiring system at the Mt Vernon, Ohio, glass plant has also been completed. The $170,000 contracts, awarded by The

Mount Your Instruments on Littleford Structures

Come to Littleford, where engineers' long years of experience assure you exacting fabrication of even the most intricate structures. Skilled workmen here shape, form and weld good steel into fine cabinets, cubicles, mechanism boxes, panels, control boxes. Consult this leading fabricator about your requirements.





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LITTLEFORD BROS., INC.
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LONG-LIFE DOUGLAS FIR PRESSURE TREATED POLES

In transmission lines–distribution, lighting or telephone systems–wherever dependable service is of prime importance you can count on Baxco Long-Life Poles to do the job.

Baxco Long-Life Poles are strong, straight, machine shaved, Coast-type Douglas Fir pressure treated with creosote and pentachlorphenol to resist rot, termites and deterioration.

You'll be proud of these poles in your line and more than satisfied with their long maintenance-free service. Write or wire us your inquiries.

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J. H. Baxter & Co. of Oregon
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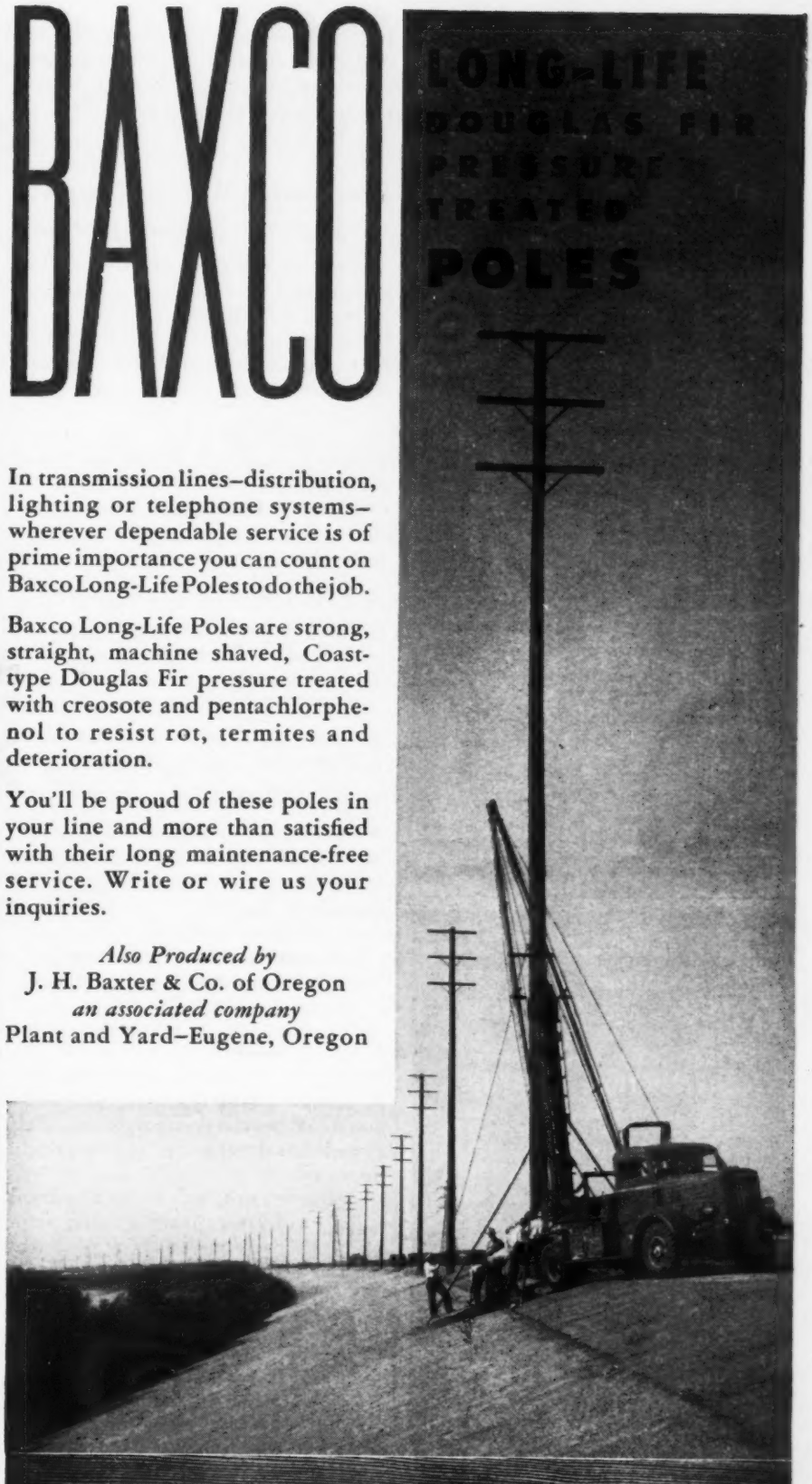

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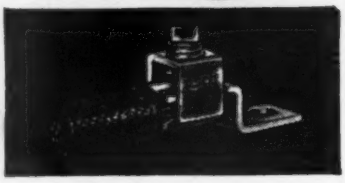
LUGS AND CONNECTORS



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Note these features also:

STRONGER CONNECTION . . . because wires are wedged into V-bottom

STRONGER GRIP . . . because top pressure bar is serrated

STRONGER PRESSURE . . . cause deep boss provides more threads.

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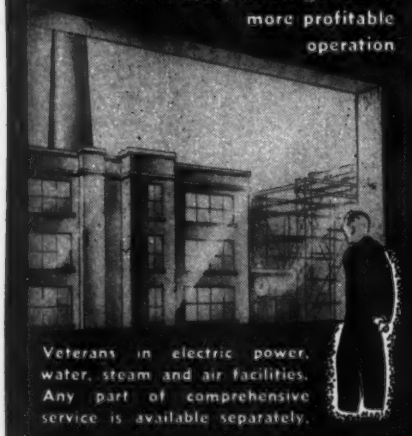
. . . every detail geared to more profitable operation



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ENGINEERS • CONSTRUCTORS • MANUFACTURERS
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Offices in key cities. See Sweets, Refinery Catalog, Chemical Engineering Catalog, etc.

Rust Engineering Co Pittsburgh, included the installation of new control equipment and change over to a new voltage without delaying production.

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Progressive Welder Opens Expanded Sales Quarters

Progressive Welder Co, Detroit, has opened local sales and sales engineering offices at 578 Maccabees Building to better serve the Detroit Metropolitan area. Previously located at the Progressive plant, the local sales office had outgrown its quarters there. The new office, to be known as the Progressive Welder Sales Co, is headed by Harry S. Rose, formerly sales manager for Progressive and associated with that company for the past eight years. Associated with Mr. Rose will be Douglas K. Renny and Douglas I. Harris, both for many years connected with Progressive Welder Co in engineering sales and service, and Thomas J. Crawford, welding consultant.

•

Makers of "Garcy" Line Move into New Plant

Signalizing the start of its 50th year in business, the Garden City Plating & Manufacturing Co, Chicago, has moved into a new plant at 1750 North Ashland Ave. The new plant, centrally located in Chicago, affords almost three times the space formerly occupied at 1430 South Talman Ave, Chicago.

The company, which makes about 1,000 different products under the "Garcy" trade mark, now employs some 400 people. With the new quarters and additional production equipment, it is expected that personnel will be greatly increased.

The new plant, with its own railroad siding, will make possible faster shipments of orders and handling of incoming raw materials.

•

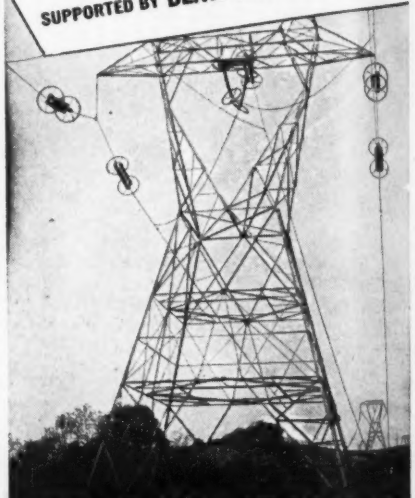
'Tour' Nela Park by Film

For those who are unable to visit the General Electric Lighting Institute at Nela Park, the General Electric Lamp Department has prepared a special, sound slide-film "tour."

In full color, and with a personal tour "voice-conducted" by Arthur Godfrey, CBS commentator, the 30-minute slide-film makes a thorough but rapid inspection of the institute.

Arrangements for showing "A Picture Journey Through the General Electric Lighting Institute" can be made by the local district sales offices of the General Electric Lamp Department.

OVER HILL, OVER DALE
THE POWER LINES OF AMERICA
SUPPORTED BY BLAW-KNOX TOWERS



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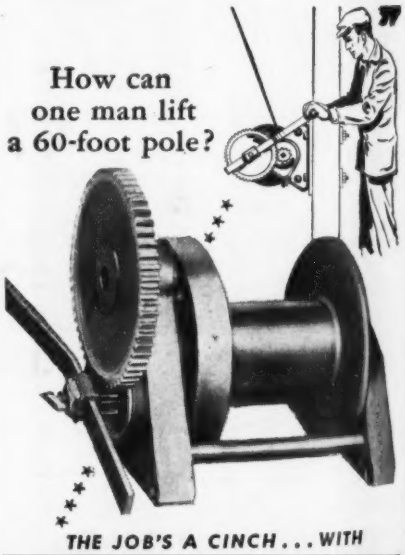
How can one man lift a 60-foot pole?



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Could *you* make money with a simple, portable, all steel winch enabling one man to lift heavy poles, drag the biggest motors, handle weights to 10,000 lbs? Get an American Hoist HANDIWINCH. Weighs only 95 lbs., sets up anywhere. Sells for $75 f.o.b. your distributor's warehouse.
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"Safety"
LAMP CHANGER

SAFE . . . No falls from ladders or shaky boxes . . . keep both feet on the floor and change those hard-to-reach bulbs!

EFFICIENT . . . Rubber Changer Head (available in sizes to fit 10W to 1500W screw type lamp bulbs) slides over bulb and grips it firmly . . . a twist of the wrist and that dead bulb is out!

HANDY. . Reverse the Changer Head on the Sectional Pole and the tapered base becomes a Broken Base Remover!

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Base Remover

NO DANGER of shock or cut fingers from bulbs which break off in the socket!

TAPERED END of Rubber Changer Head fits snugly inside broken lamp base . . . twist the pole and friction brings it out!

HARD WOOD SECTIONAL POLES in 4 and 6 foot lengths can be fitted together to reach normally hard-to-get-at bulbs up to 30 ft.

Send for NEW Descriptive Folder and Price List!

"Like the Grip of Your Hand"

THE G. R. CHADSEY MFG. CO.
Dept. W-816,
HARTFORD 1, CONN.

Be SAFE...
Be SURE!

Use TRICO FUSE PULLERS

. . . the safest way to pull and replace fuses and handle all electrical apparatus.

Order from your Jobber or write . . .

TRICO

TRICO FUSE MFG. CO., Milwaukee, Wis.
In Canada: IRVING SMITH LIMITED, Montreal

Recent Rate Changes

TECUMSEH (NEB.) municipal system increased its rates 15 percent on August 1, and the 25 percent discount for prompt payment was reduced to 10 percent. Increased operating costs were given as the reason for the increase.

PEND OREILLE COOPERATIVE, Newport, Wash., has decreased its minimum charge from $3.50 to $2.50. New rates will be 9 cents a kwhr for the first 40 kwhr, 5.5 cents for the next 40, 2.5 cents for the next 120, and 1 cent for all over 200. The former rate was 9.5 cents a kwhr for the first 40 kwhr with the lowest rate 1.5 cents for over 200 kwhr.

MONTANA POWER CO has reduced rates for public type lighting from $5 a kw monthly to $4.25. The order covers lights operated from dusk to dawn and includes those for street lighting, park lighting, public playgrounds, airports and runways. The public will save approximately $20,478 annually.

KLAMATH WATER, LIGHT & POWER CO has been authorized by the California Public Utilities Commission to raise its rates until October 1, 1948. The increase will give the utility 50 percent more revenue. However, rising operating costs will cut profits to 1 percent of invested capital.

FORT LOUDOUN ELECTRIC COOPERATIVE, Madisonville, Tenn., has removed the 10 percent development surcharge from commercial and industrial bills. The annual saving to these classes of customers will be $3,400.

SASKATCHEWAN POWER COMMISSION has reduced rates approximately 10 percent in Prince Albert. However, the commission is making provision on the new billings for an added 5 percent charge to go to the city. This reduces the savings to consumers to approximately 5 percent.

BOSTON EDISON CO has increased rates under a fuel charge which has been in effect since 1940. However, the charge had never been previously applied to retail customers. The charge is approximately 0.7 mill per kwhr and will be applied to residential, small commercial, and street lighting customers.

•

Connecticut Utilities Fight 3% Use and Sales Tax

Five of Connecticut's largest utilities have gone to court to seek exemption from payment of the state's new 3 percent use and sales tax.

The companies claim that although their bills to consumers are not taxable, they will have to pass on to their consumers the cost of the tax payments which they will be compelled to make on their purchases of fuel, machinery, wire, and other supplies. They say taxes on these items would be $1,245,000 annually.

Utilities who joined suit are Connecticut Light & Power Co, United Illuminating Co, Hartford Gas Co, Southern New England Telephone Co and Bridgeport Hydraulic Co.

Where and How to Use *Crapo* Steel Conductor

Ask for This Guide to Low-Cost Rural Lines!

If future plans call for the extension of rural service, be sure to ask for a copy of this Manual! A study of its contents will show where and how *Crapo* Steel Conductors can be used to profitable advantage in rural distribution systems.

This illustrated book contains pertinent data on the electrical characteristics and electrical performance of these unique conductors. It shows how construction costs can be reduced by the use of long spans, gives initial and final sag and tension data, describes construction practices, cites typical installations.

Crapo Steel Conductors are especially applicable to rural taps and branches where construction and maintenance costs are important considerations. The experience of a number of leading utilities over a period of years shows conclusively that *Crapo* Steel Conductors are giving dependable, economical and efficient service on thousands of miles of line in rural areas.

Crapo Steel Conductors are distributed by Graybar Electric Company, Inc. Ask a Graybar representative for a copy of the *Crapo* Steel Conductor Manual or write direct for Manual No. 110-C.

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